Original Scientific Paper

doi:10.5937/jaes15-14664 Paper number: 15(2017)3, 444, 294 - 299

GENERAL PROBLEMS OF THE INTERDEPENDENT DEVELOPMENT OF THE BIOSPHERE AND URBANIZED ENVIRONMENT

Andrey Leonidovich Pozdnyakov*
Southwest State University, Faculty of Building and Architecture, Kursk, Russia
Marina Mikhaelovna Zvjagintseva
Southwest State University, Faculty of Building and Architecture, Kursk, Russia

Urbanization is a complex process, the understanding of which is treated differently by different specialties. If for the sociologist the main relations in this process are urban relations, even if they are taken in the whole breadth of their social content, then for the ecologist the manifestations of the biological consequences of urbanization are more important – the city's attack on the living nature, the entire amount of negative impacts of urbanization on the ecosystems of the Earth. Urban formations act as extremely powerful centers of perturbation and degradation of the biosphere.

Key words: Urbanization, Biosphere, Ecology, Nature management, Urban planning, Territorial dispersion

INTRODUCTION

Relations between cities, towns, rural settlements, resettlement in general and the environment are characterized by great complexity and complexity. On the one hand, the integral part of the environment is an integral system of nature: it is composed of physically different media – gaseous, liquid and solid, and biologically unequal substance – living, biocosmic and abiotic, and the components of nature are not the same in their physical essence, chemical composition, the intensity of the exchange of matter and energy, the diverse connections through which the evolution of nature became possible.

On the other hand, the artificial environment (including urban planning) is quite complex and has its own direct and reverse links, characteristic of a complex socio-economic multi-level territorial system.

All this testifies to the fact that the study of the features of the interaction of settlement and nature, the formulation of theoretical principles of such interaction is impossible without the use of a sufficiently wide arsenal of appropriate methodological tools – elements of system and factor analysis, game theory and solutions and other techniques. This makes it necessary, in turn, to structure the most important initial concepts and introduce the necessary definitions. In this case, such concepts are the environment, the biosphere, the natural environment, the technosphere and the urban environment.

The environment is a set of natural, practically unchanged by human activities, significantly changed as a result of such activities and artificially created material elements, in the environment of which and in the process of interaction with which the vital activity of people in the given territory occurs.

Since the article is devoted to the study of the problem of the interaction of settlement with the environment, the development of a methodology for solving the ecological problems of settlement in the applied sphere, the understanding of the environment in it is more general: it includes mainly the natural environment, spatial elements of the urbanized environment and phenomena generated by anthropogenic activity, and quantum nature (noise, electromagnetic radiation, radiation, etc.).

At the same time, the breadth of the problem and its regional character make it possible to consider the general features of settlement as a spatial form of interaction between society and nature (including the ecological aspects of urbanization.

*Southwest University, Kursk, 50 лет Октября ул., 94, Kursk, Курская обл., Russia, 305040; dekanov@bk.ru

DISSOLUTION AS A SPATIAL FORM OF INTERACTION OF SOCIETY AND NATURE

Settlement, i.e. the distribution of the population on the territory of countries, regions and cities, characterized by a certain hierarchy and cyclical relations in the sphere of work-life, is the spatial basis of the life of society. Settlement is the territorial organization of the population – the main productive force of society [01]. At the same time, it is important to note that for the effective functioning of the productive forces, there is little space alone – it must be organized in a certain way. And resettlement plays a regulating and unifying role in the territorial structure of the productive forces, since in its essence it must most fully satisfy all human needs [01].

Labor, as K. Marx defined it, is “a process that takes place between man and nature, a process in which a person mediates, regulates and controls metabolism between himself and nature through his own activity” [01].

To this we should add that within the range of distribution of the interconnection of man, human societies with the natural environment, they go far beyond purely industrial interests, including in essence all kinds of human activity, all aspects of human life (life, rest, treatment, sport, and so on .). Thus, settlement in the broadest sense of the word is the most important spatial form of interaction between society and nature.

The main material elements of settlement are human settlements – cities, towns, rural settlements, which, being interconnected within certain territories by various functional connections, are in very complex interaction with the surrounding natural environment. The strength and direction of such interaction varied depending on the development of forms of settlement, the growth of cities, their energy equipment and many other factors.

The first settlements in the full sense of the word arose on Earth 10-12 thousand years ago, when agriculture began to turn into one of the most important human activities. These settlements numbered, probably, no more than 100-150 people and were sufficiently distant from each other. Approximately within a radius of 3-4 km from the settlement, the natural landscape underwent a rather strong change – the biogeocoenotic natural cover was transformed into agrocenoses (cultivated fields, vegetable gardens, etc.). Since the density of the cultivated areas was relatively small, the immediate environment of the settlement was a mosaic of transformed and almost natural landscapes and had a very high ecological potential. Within a radius of 10-15 km, the landscape was even less transformed by a man who used it as a hunting ground and a natural storehouse (picking berries, mushrooms, nuts, honey, etc.). In general, the man of the upper Neolithic due to its small number and comparatively low specific pressure on nature almost completely fits into the biotic cycle, although the first anthropogenic ecological crisis caused by the recapitulation of large animals (the crisis of consumers) falls precisely at this time.

Cities emerged in the III millennium BC as a product of the process of an ever stronger territorial division of labor, as a spatial form of the separation from agriculture of trade and handicraft. The flourishing of the slave-owning system was simultaneously and sometimes the heyday of the cities of the ancient world, reaching impressive sizes. Thus, for example, Babylon (Assyria) and Memphis (Egypt) numbered 80 thousand each, Athens during the heyday – 300 thousand, Carthage – 600 thousand, and Rome of the era of Augustus Octavian – even 1 million inhabitants [002]. Ancient cities, with few exceptions, were distinguished by crowded population, low level of improvement. The density of the population in Alexandria from the time of Queen Cleopatra reached 760 people, in Rome under the emperor Augustus – 1500 people per hectare, while the density of the population of modern London, Tokyo and New York (Manhattan) is 700, 920 and 1000, respectively, per hectare [03].

The cities were very closely connected with agricultural production, many peasants lived in them. Pressure on the nature surrounding cities, due to the high intensification of agriculture and livestock, has increased dramatically – mosaic landscapes in the suburbs gave way to monocultures, soil erosion has become a common occurrence.

In the Middle Ages, along with the slave-owning system that was replaced by feudalism, a new type of cities was born: a fortress city surrounded by powerful defensive structures. The support centers that stood at the intersection of trade routes eventually became the main centers of trade, handicraft, religion. The largest of them were formed as the main political, administrative

and economic centers of the emerging nations. Medieval cities, as a rule, were inferior in size to the settlements of the classical era and rarely numbered more than several tens of thousands of inhabitants. The population of the largest of them, for example, London and Paris reached in the XIV century, respectively, 100 thousand and 30 thousand inhabitants.

The industrial revolution, ripened on the basis of great geographical discoveries and gaining strength along with new, progressive social relations of capitalism at that time, led to the rapid development of industry, and, as a consequence, cities, and the negative effects of industrialization and urbanization manifested itself first.

Rapidly growing cities quickly surpassed their classic predecessors in terms of population. By 1800 London had crossed the millionth line, by 1850 – Paris; by the early twentieth century there were already 12 millionaires in the world, and the rapid growth of cities in England, Germany, the USA, France, and some other countries continued.

Congested buildings, unsanitary conditions in the working quarters of the largest industrial centers such as Manchester, Birmingham, Lyon and many others, the epidemic of cholera, typhoid fever and other dangerous diseases made it possible for the classics of Marxism to question the very existence of such cities. “In the face of major cities, civilization left us such a legacy, getting rid of it will cost us a lot of time and effort. But they must be eliminated and will be eliminated, even if it was a very long process,” Engels wrote [04].

The most formidable manifestation of the disharmony of man and nature was the epidemiological danger. Over time, thanks to both the achievements of science and technology, the success of sanitation and hygiene, the development in the cities of the water and sewer economy, and the struggle of the proletariat for its rights, this danger was significantly weakened. But along with this, as mentioned above, a new, no less formidable environmental problem arose – the progressive pollution of air, water basins, soil and vegetation cover, degradation of natural landscapes. The situation was exacerbated by the extreme density of urban settlements in many countries, primarily England, Belgium, Holland, parts of Germany and France, which often led to the merging of these spaces into vast areas with degraded nature.

The cities grew not only quantitatively, but also qualitatively. On the Earth a new kind of settlement arose – the agglomeration of industrial cities. As a form of settlement agglomeration of populated areas was known even before the industrial revolution. Feudal castles were often built close to each other and overgrown with plantations, forming a kind of agglomeration. Warsaw, for example, already in the VIII century became an agglomeration of two cities, laid in the Middle Ages, widely spread outskirts and settlements, more or less established as independent small towns. English textile industry centers of the XVII and XVIII centuries represented a number of metropolitan territories, the main cities of which were surrounded by scattered villages around them, whose population was engaged in both farming and the production of fabrics [05]. Similar “agglomerations” are known in Germany, Russia (textile factory villages in the central industrial area) and many other countries.

In the various regions of the Earth there are giant metropolises, clumps of cities with a large population. Their territories sprawl for many hundreds of square kilometers, absorbing neighboring settlements and forming giant urban agglomerations and urbanized areas, stretching in some cases for a thousand or more kilometers. So, in the US on the Atlantic coast a huge urbanized area, occupying 150 thousand square km with a population of 40 million people formed (merged agglomerations of Boston, New York, Philadelphia, Baltimore and Washington). It is believed that by the end of the century three gigantic urban areas will form in the US – Boswash (Boston-Washington), Chiptis (Chicago-Pittsburgh) and Sanxan (San Francisco-San Diego), with a population of 80 million, 40 million and 20 million people. On the Pacific coast of Japan, as a result of the merger of the agglomerations of Tokyo, Yokohama, Kyoto, Nagoya, Osaka and Kobe, one of the world’s largest conurbations with a population of 60 million people (half of the country’s population) is emerging. Huge multimillion agglomerations formed in Germany (Ruhr), England (London and Birmingham) and the Netherlands (Randstad Holland), and others.

ECOLOGICAL ASPECTS OF URBANIZATION

Most researchers in the process of modern urbanization point out that the role of integrative factors of urbanization is increasingly growing,

that the urbanization sphere, localized earlier in the cities, because of their territorial growth, extends more and more to the countryside, encompassing the entire society as a whole. The most important material result of modern urbanization is a large urban agglomeration, a cluster of urban settlements, united by intense, diverse links into a complex dynamic system. Conclusions are drawn that the further development of the scientific and technological revolution will lead to the fact that the main, most progressive type of settlement in the future will be the urbanized area, i.e. a kind of agglomeration of agglomerations [06].

Urban structures of the highest territorial level – urban agglomerations, urbanized areas, group forms of urban settlement in general, strengthened and deepened the nature of the interaction of settlement with the natural environment, as nature and the urban environment in the modern era interact in large spaces, and the expanding process of urbanization not only leads to the strengthening of such Interaction, but also involves extensive inter-settlement areas - recreation areas, engineering corridors, etc., in this process. The emergence of group forms of settlement marks a new stage in the relationship between the city and nature. Local forms of interactions between urban and natural environments, characteristic of autonomous cities, led, as a rule, to a focal disturbance of the environment, to the degradation of the "edge", a comparatively small ring of natural complexes around the cities. Group forms of settlement, widely developed in the XX century and especially in the second half, interact with the natural environment in a different way: local forms of interaction give way to its regional forms, characterized by greater depth of changes in the natural environment, the spread and concentration of anthropogenic loads in vast areas.

Urban agglomerations, urban areas are areas of deeply altered anthropogenic activity of nature, peculiar foci of ever increasing human activity, territories where the replacement of natural biogeocenoses with urban and agrocoenosis is particularly intensive. The diverse human activity associated with the transformation of nature goes far beyond the immediate territory and influences all components of the natural environment. So, for example, physico-geological changes in soils, groundwaters and other components of the lithogenic base are felt depending on specific conditions within a radius of 25-30 km, biogeochemical changes in the environment – at even greater distances. Studies show that large cities, and even more urban agglomerations, have an impact on the environment 50 times greater than their own radius [07]. Urbanized environment is especially affected by soils, water bodies, air basin and vegetation cover.

The most common criteria for the scale of anthropogenic pressure on the natural environment within urban areas are the size of a city or agglomeration, the density of population and buildings, the economic profile of urbanized education (industries, the degree of development of sanatorium-resort functions, etc.). It goes without saying that the ecological characteristics of the urbanized area, with a high degree of convergence of the agglomeration nuclei among themselves, are much worse than in the individual agglomeration, due to the "effect of imposing" anthropogenic urban loads on the same territory.

All that has been said above indicates that urban formations act as extremely powerful centers of perturbation and degradation of the biosphere. Due to the enormous concentration of man-made loads in cities and urban agglomerations, the irreversible disruption of the water and land regime in them, the primitiveness of the negligible biological productivity of the urban environment, even in well-maintained and greened settlements, the strength and speed of anthropogenic impacts will always exceed the rates of adaptation to these environmental impacts.

In order not to do this, in vast areas it is necessary to ensure the biosphere as a whole and its elements an equilibrium state, that is, the regeneration of clean water, air, soil and vegetation cover, individual ecosystems and biogeocenoses. The biological "failure" of the Urbocenosis must be constantly compensated by more productive biogeocenoses. For this reason, for example, the concept of an ecumenopolis – a "world city", whose formation on the Earth by the end of the XXI century is predicted by some western urbanists, and, in particular, K. Doksiadis, is of only theoretical interest.

At the same time, the urbanized environment and nature in the broadest sense of the word are opposing but not mutually exclusive concepts, since they have one very important common property arising from the social essence of man:

"a big city and a virgin nature are like two poles of the modern Biosphere, necessary to man in equal measure" [08]. This just judgment in the conditions of progressive population growth and development of production makes it necessary to dwell on the most widespread polar notions about the role of urbanization in the evolution of the biosphere, the relationship of urbanization and nature.

The first, a fairly widespread view, is based on a sharply negative attitude towards urbanization as a process hostile to living nature. This view reflects the position of a wide range of Western environmentalists – "alarmists" who see no other way out to save the biosphere than the curtailment of production, the cessation of the growth of large cities, the immediate stabilization of the population, etc.

The second view is the lesser known and diametrically opposite to the first: the idea that nature can be preserved not in spite of urbanization, but only thanks to it. This view is based on the idea of urbanization as a progressive process of comprehensive development of society and nature, on a high assessment of the potential opportunities of urbanization, on the recognition of harmful thoughts about excessive urbanization and the need to find ways to neutralize the consequences of urbanization in the environmental sphere. It seems that both opinions are too straightforward to reflect professional interests in the problem under consideration and cannot serve as a comprehensive approach to its solution in the field of urban development.

Urbanization is an objective and irreversible process, and to try to turn it back is not only pointless, but also harmful. However, it is absolutely necessary to establish reasonable limits for the development of urban habitats and comprehensively investigate their links with biogeocenoses. To consider that nature (in the broad sense of the word, of course, and not only cultural green plantations in cities) can be preserved only through urbanization – this means putting an equal sign between urbanization and scientific, technical and social progress, which is dialectically wrong. Urbanization is a consequence of the scientific and technological revolution and one of the important prerequisites for its further development. The scientific and technological revolution and urbanization, along with positive, have also negative aspects. Scientific and technical and social progress cannot, in their essence, have negative sides, otherwise it would not be called "progress". It concentrates in itself all that advanced and necessary for mankind, which accumulates in the process of the scientific and technological revolution, including in the process of urbanization. It is also important to take into account the fact that in planned urbanization there are huge opportunities for purposeful change and systematic transformation of the natural environment, giving it the properties most appropriate to the new conditions, a real opportunity to design biogeocenoses with pre-determined properties that can be highly ecological and in an urbanized environment.

At the same time, the uncontrolled expansion of the process of urbanization as a whole (and not just urban relations) to the entire territory of individual countries and large regions will inevitably entail a disruption of the normal functioning of the biogeocenotic cover of the planet. Therefore, along with the urbanized areas, it is necessary to ensure the preservation of purely natural areas that can reproduce not only biomass as food raw materials, but also clean air, water, fauna, meet the needs of people in rest, the diversity of the natural environment.

Between urbanization and nature there are complex dialectical connections. On the one hand, the process of concentration of the population in a very small number of large settlements (in comparison with rural areas) undoubtedly increases the strength of the anthropogenic impact on nature and the danger of its destruction in the centers of urbanization.

On the other hand, in the very concentration of production and the population, powerful economic levers are laid, allowing a complex of engineering technological and hygienic measures to protect water, air, soil and vegetation in the most vulnerable urban areas for the biosphere. Moreover, often urbanization and industrialization lead to a significant improvement in the environmental situation – when creating oases in arid zones, for example, as it is noted by many authors.

The process of urbanization also contributes to the preservation of vast natural landscapes outside the zones of concentration of cities.

True, on the other hand, it is known that cities spawn problems of recreation in nature, and rest in nature, in accordance with the needs of mod

ern man in comfort, makes necessary the urbanization of recreation areas.

The growing level of motorization, increasing mobility of the population are expanding the areas of human access to natural landscapes, but, on the other hand, these processes contribute to the construction of roads and a more even distribution of recreational loads on the natural environment.

CONCLUSION

Thus, the impact of urbanization on nature is far from unambiguous and therefore it is more correct to read that nature can be preserved not contrary to urbanization, but thanks to it, but only by overcoming negative consequences and taking advantage of this process. It seems necessary to regulate the relationship between urbanization and nature in space and time by effectively combining economic and environmental planning with urban planning at all its territorial levels.

ACKNOWLEDGEMENT

Author thanks the Rector of the Southwest State University, Doctor of Technical Sciences Yemelyanov S.G.

REFERENCES

1) Luzhkov, Yu.M., (1996) Environmental problems of the large cities and the way of their decision," Industrial and civil engineering, No. 9, pp.4-9.
2) Leggett R. (1976) Cities and Geology, 558 pp.
3) Fedorenko N.N., Reimers N.F. (1974) Nature, economics, science // Nature, №3, pp.11-24
4) Marks K. and Engels F. Works, vol.2
5) Pozdnyakov A.L, Samokhvalov A.M (2014) Urbanization and its impact on the ecology of cities and settlements: News of Southwest State University №6 (57), pp. 74-78.
6) Pivovarov Yu.L. (1974) Concentration of functions and tendencies of urbanized settlement, p.140-150
7) Pozdnyakov AL, Pozdnyakova EV (2016) The Main Trends in the Development of Industry in the Cities and Towns of the Position of Environmental Safety // International Journal of Applied Engineering Research, Volume 11, Number 23, pp. 11331-11334.
8) Rodoman B.B. (1974) Polarization of the landscape as a means of preserving the biosphere and recreational resources, p.150-163.

Paper sent to revision: 26.07.2017.

Paper ready for publication: 07.09.2017.