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Theoretical Principles of Wave Urbanistics

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Summary. During studying and mathematical description of the trends of urbanized territories development as ecological and town-planning systems there were several vague similarities founded between its major parameters change periodicity and other physical values, having undulatory nature. Obtained counterparts had predetermined interest for search of fundamental basics of urbanization. It turned out that all laws of Nature has the same basis – power permanence rule. This law is known in philosophy as principle of «change of unchangeable», in ecology – as a law of ecosystem self-regulation, in accordance to which at conditions of insufficient occupancy of the territory the population amount growths, and at conditions of over-occupancy it decreases. According to research, also development attributable to the dynamics of urbanized territories is noticeable, in which all the four types of physical interactions are expressed to a certain degree. These and other results of research have allowed to articulate the main principles of ecological space «urban physics» content, which have proven to be coordinated with the postulates of new single field physics (Bishkek version). The above-mentioned have allowed to lay down the theoretical foundation for an occurrence of a new branch in the science of town-planning i.e. wave urbanistics, as a science of management by unduly processes of territories development in order to provide a conditions of their sustainable development.

Key words: urban planning, sustainable development, ecosystem self-regulation, ecological balance, demographical capacity, ecological and town-planning systems.

INTRODUCTION

The world-wide issue of stable development is also sigificant for modern Ukraine, the depopulation of which during a period from 1993 to 2006 was performed due to accelerated decrease of city dwellers number (Fig. 1) on the background of following expansion of the cities` territory.

Evidences have been mentioned of the fact that the process of urbanization in Ukraine, just as in the developed countries of the world, has passed from the stage of increasing to the stage of stagnation. Therefore, there is a need for search of theoretical and methodological principles of regulation of stable development, using special research methods.

PURPOSE AND METHODS

The purpose of research is the revealing of theoretical principles of urbanized territories stable development management. As a basic method the method of analogies was approved, which is used in human ecology since

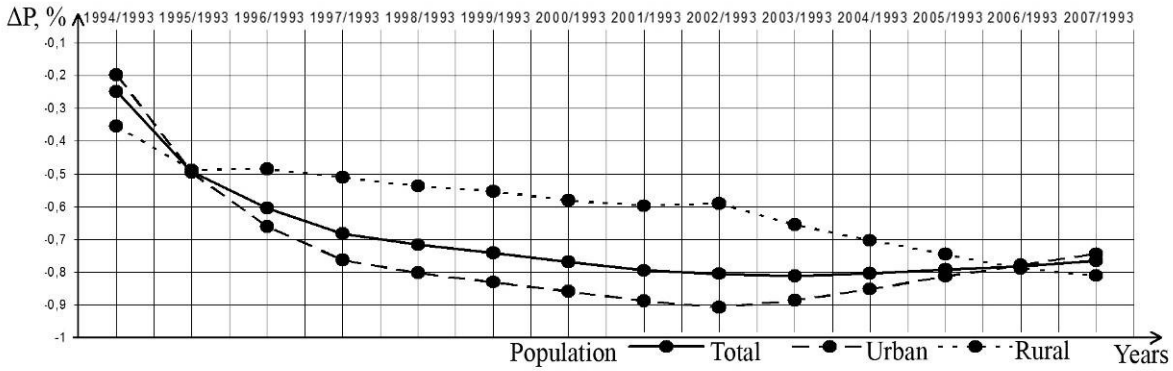


Fig. 1. Average annual rate of downsizing of Ukraine`s population from 1993 to 2007

it allows do not experiment with a system, part of which the human personally is, but to use knowledge about general regularities of development and to borrow images and models from more developed sub-disciplines such as physics or mathematics.

PHYSICAL PARALLELS

During studying and mathematical description of urbanized territories` development trends as ecological and town-planning systems (ETPS) there were some vague similarities discovered in periodicity of changes and main parameters (territory, population, dynamics of population, demographical capacity of the territory) and other physical values having adulatory nature. It was found out that mechanical, electromagnetic and urban-ecological processes follow the same quantitative theorem. It was discovered there is a need to be interested not by oscillatory values but by how these oscillations take place [1]. Obtained analogies have enforced the search for other ecological and physical regularities of urbanized territories development [2, 3].

It was discovered that all the laws of Nature have the same basis – power permanence rule (Lagrange, 1788; Maxwell, 1855), which determines fundamental principles of open systems stable development [4]. From this rule it follows that any change of produced power is compensated by corresponding change of lost power. This law is known in philosophy as principle of «change of unchangeable», in mathematics – as invariant, in physics – as tensor, in ecology – as law of ecosystem self-regulation [4, 5].

According to the law of self-regulation, the purpose of ecosystem development is the achievement of the state of ecological balance. Ecosystem has a certain capacity for every biological species. The reserve of this capacity, which is insufficient occupancy of territory, determines an increase and its exhaustion, which is over-occupancy of territory, causes a reduction of a given species density (Fig.2) [5]. According to the results of our research, the dynamics of ETPS development is also significant, in which there were discovered certain expressions of all the four types of fundamental physical interaction: strong, weak, gravitational and electromagnetic [1-3]. These and other results of research have allowed to form the major principles of «urban physics» of ecological space content, which have been found to be coordinated with the postulates of new physics of single field (Bishkek version) [6, 7].

POSTULATES OF URBAN PHYSICS AND PHYSICS OF SINGLE FIELD

1. According to the new physics built on the model of rotating Universe, the basis of all the physical interactions is a single field of force. Depending on the level of supervision, this field appears to researchers once in the gravitational form, once in the electromagnetic, once in the form of nuclear fields [6, 7]. As it was mentioned before, the similar thing was discovered by our research, in which urbanization is considered as a natural process of establishment and development of

the population-environment system in a multi-level ecological space [1-3, 8].

2. In the physics of single field, a particular role is played by the idea of absolute, which brings the single universal and simple to the foreground, whereby for all levels and all systems laws appear in the same way. And if the physics of Einstein rests on the thesis of relativity of all systems of coordinates and absoluteness (regularity) of speed of light, then new physics rests on the thesis of absoluteness of all systems of coordinates and relativity (with variable values) of speed of light. The thesis of relativity of systems of coordinates also lays at the basis of estimation models of environment state and territories development, which are usually built on the comparison of modern state of town-planning object with the previous period of its development or with average factors by country, region or world [9-13].

3. By the absoluteness of systems of coordinates in new physics is meant, as minimum, the center around which the Universe is rotating, the «age» of which is determined by the period of its full rotation. According to our researches, the absoluteness of system of assessment coordinates of territories` stable development is determined by the law of ecosystem self-regulation. Basically, The methodology of assessment and regulation of territories stable development offered by us is shifted around this law of planetary evolution. In this plane, the center of the offered assessment system of coordinates at the targeted stage of ecosystem development becomes – the state of its ecological balance (see Fig.2, stage *VI*), in which the functional dimension with ±10 % range of deviation of the region's population demographic capacity and amount parameters is [9]. Quantitative expression of parameters of balance range – one-of-a-kind «bifurcation point area» of ETPS following development ways allows to describe its qualitative condition, forecast development, determine correspondent to «ecological age» (stage of its development) strategy of the following development of regional town-planning object. The space center, around which the region is «gathered» and "urbanization universe" is spinning, is a city (Fig.3-5) [14-16].

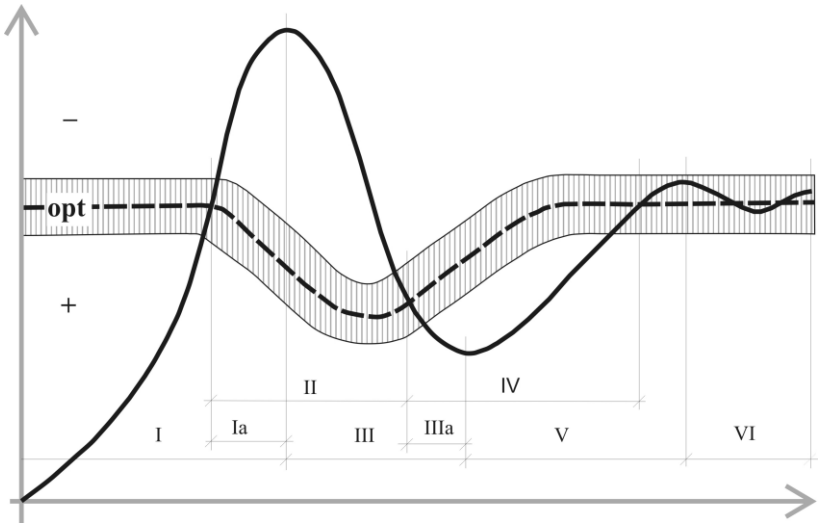
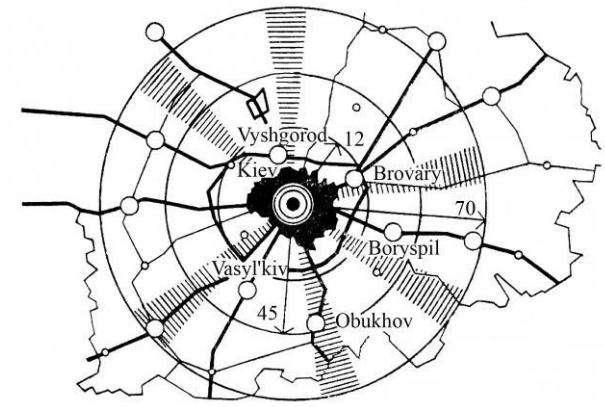


Fig. 2. The self-regulation ecosystem by V. Dolnyk:
I-VI – stages of ecosystem population capacity of the environment range of equilibrium.
—— – population
- - - - – capacity of the environment
||||||| – range of equilibrium
± op t – quality of environment

4. By correspondence of speed of light in new physics of universe that is rotating is meant insignificant difference in speed of light determined by direction if its flight – «along» or «against» the direction of the universe rotation. To some extent, a similar situation occurs in the case of expression of law of ecosystem self-regulation under which the speed and direction of dynamics of population (increase – decrease) depends on what stage of cycle (wave) of development the changes occur. At the beginning stage in conditions of reserve of ETPS rigidity, at a certain environmental level, the efforts of town-planning and ecological system were co-directed to the state of ecological balance, which is an increase of population (see Fig.2, stage *I*) and activation of economic activity. In conditions of exhausting of capacity their efforts against the trend are directed for: town-planning – for following expansion of area borders and going of ETPS for a new level of its aerial integrity with new ecological potential and balanced condition; for restoration of the previous balanced condition, which comes don to the decrease of population and fading of economic activity (see Fig.2, stage *III*). Specified anti-directedness of efforts at the final (targeted) stage of certain cycle of development leads to occurrence of constant oscillations in the range of ecological balance (see Fig.2, stage *VI*). By direction of the optimum arrow these oscillations occur (if there are no additional



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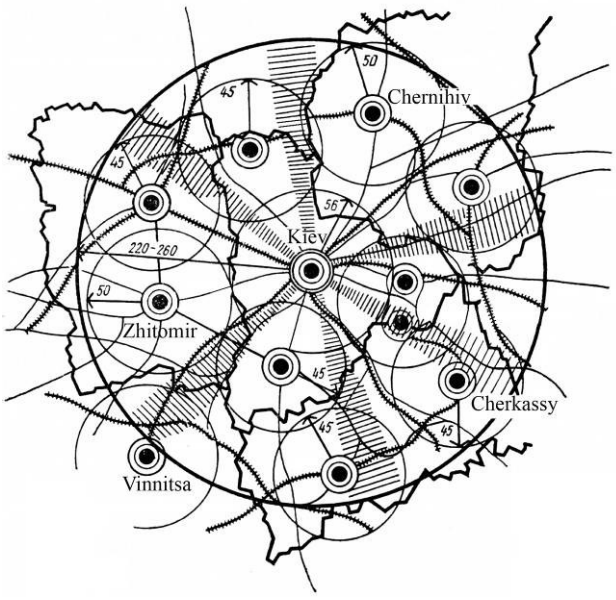

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Fig. 3. Space-donut development of Kyiv city agglomeration (*a*) and Kyiv capital region (*b*) by M. Dyomin

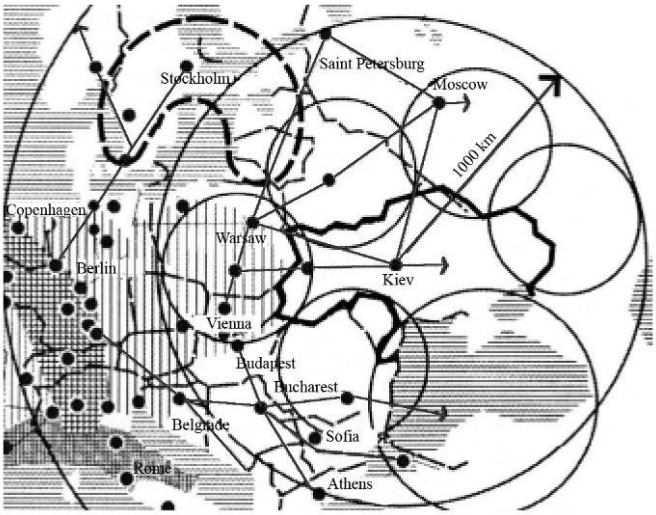
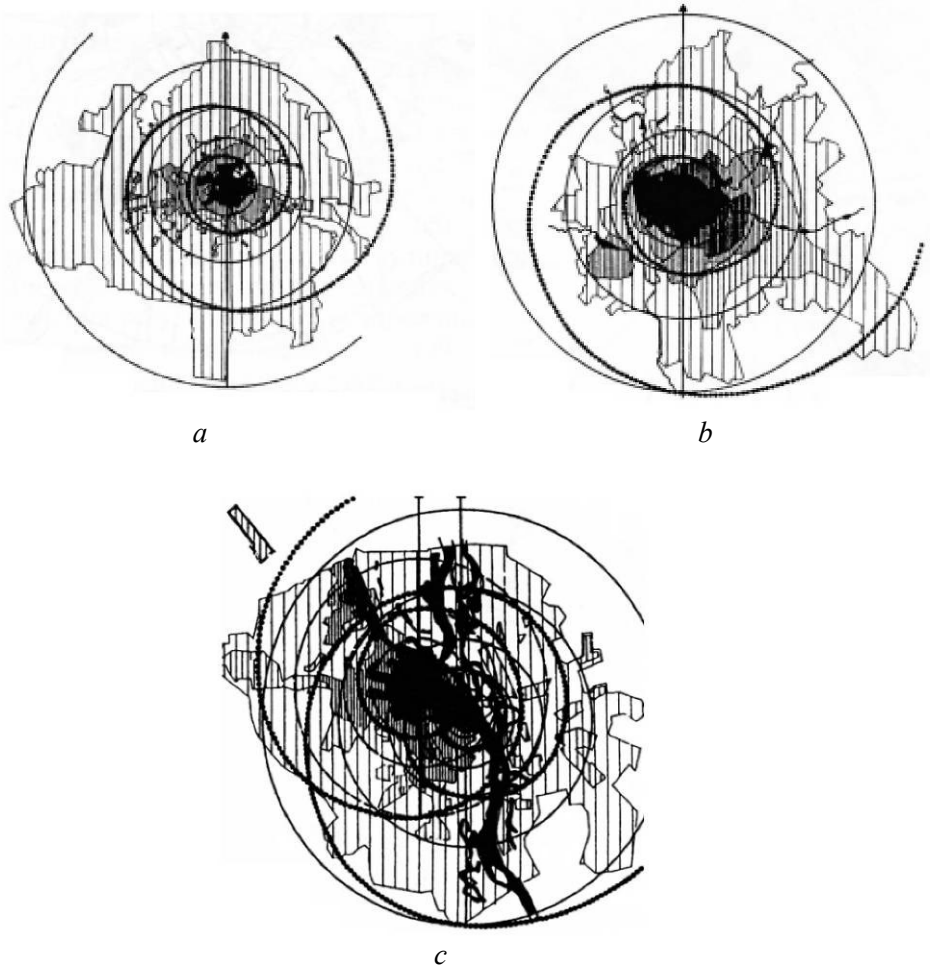


Fig. 4. Ukraine in structure of European space by Y. Bilokon



a *b* *c*

Fig. 5. Space-helical development of Lvov (*a*), Kharkov (*b*), Kyiv (*c*) by N. Shebek

special circumstances) in the same way – the trend of less action, to the place where the state of system is mostly profitable, optimum and balanced energetically. Such state allows the system to spend energy efficiently and demonstrate the maximum activity given by nature.

5. In the physics of single field the term of levelness is introduced and (by direction of optimum arrow) the transfer from level to level is described. So the kinetic and magnetic energy of motion is a hierarchically higher form in comparison with potential and electrical rest energy. In the present physics this is not the case. Here there is a number of systems of coordinates and reference points but only one level of supervision. Multi-levelness of development is also attributable to urban processes. This is expressed by the presence of concentric areas of influence of the central city in ecological space of a region, country, or continent (see Fig.3, 4).

6. There is a completely new mechanics in absolute physics which is the mechanics of body motion «from the inside». This allows to understand what is «filled» by body at change of qualitative conditions and absolute nature of multi-level motion. Here, instead of conventional «external» mechanics which obligatory provides supervision for the body from aside the division of supervisor and event is absent. In our case such mechanics of motion «from the inside» is basically development of ETPS, the regularity of which is ensured by continuous change of stages and qualitative conditions in multi-level cycles of unduly development of urbanized territories. Regarding the division between supervisor and event, during research we are always inside the ecosystem which is changed by us, supervises and changes us since we are its integral part.

7. The magnetic field in new physics is a field of forces of momentum and vortex field, appearing at translational or rotational movement of body. As was determined in research, the population in space-time LT-system of physically measured values has the scale of mass ($[L^3T^{-2}]$ – cube with angular acceleration [4]), which basically determines the force of momentum and gravity and in our case – «gravity-magnetic» field of ETPS (see Fig.3 – 5). The population density in LT-system will have dimension of acceleration (L^3T^{-2} / L^2 = $[LT^{-2}]$) [13]. Nowadays approximately 70% of population of Ukraine and more than 50 % of World`s population is concentrated in cities. In this aspect they have really become the centers of masses around which the universe of civilization is «rotating». In the evolution of cities and urbanized regions the mentioned «rotating» discovers itself by translational-unduly (Fig.6), concentric-donut (see Fig.3, 4) and translational-rotational (see Fig.5) accelerated process (curvilinear translation is always an accelerated one) and pulsing-unduly event of multi-level development of population-environment ETPS in ecological space city-region (Fig.7) [8, 18, 19].

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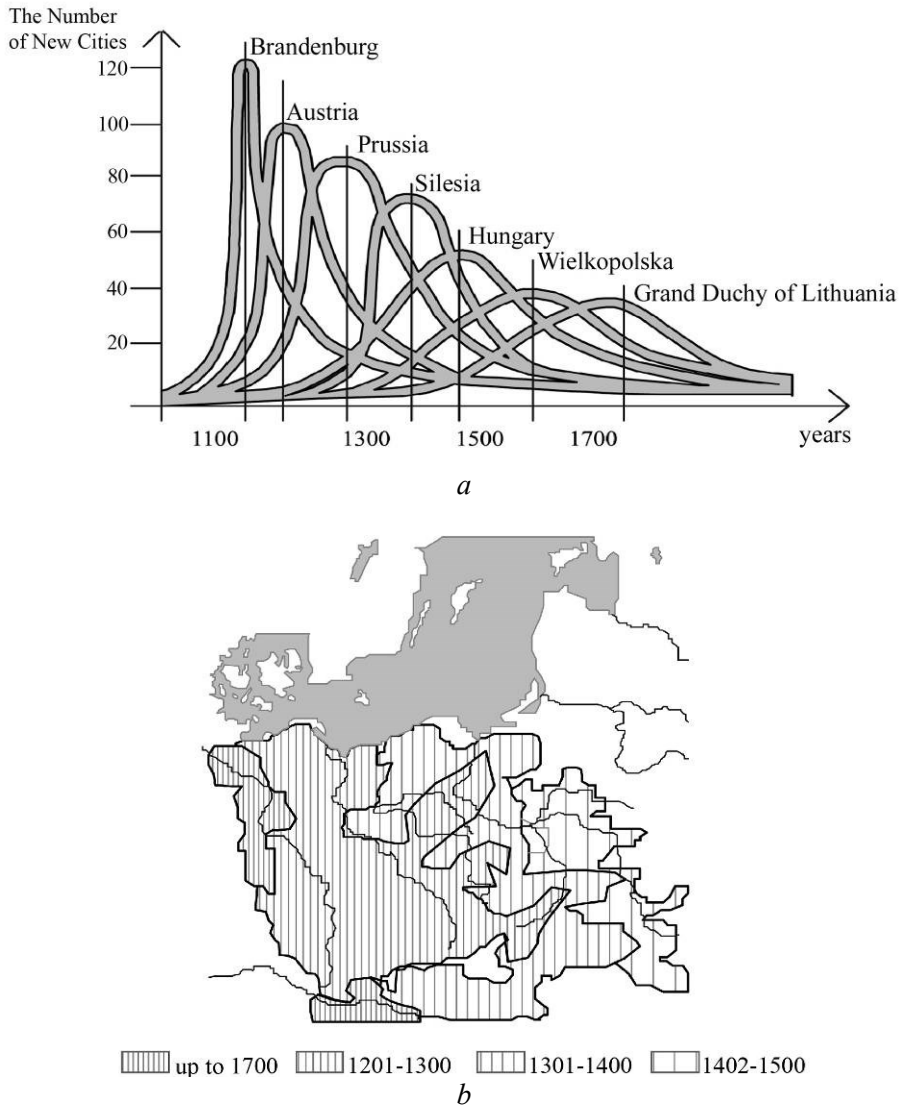
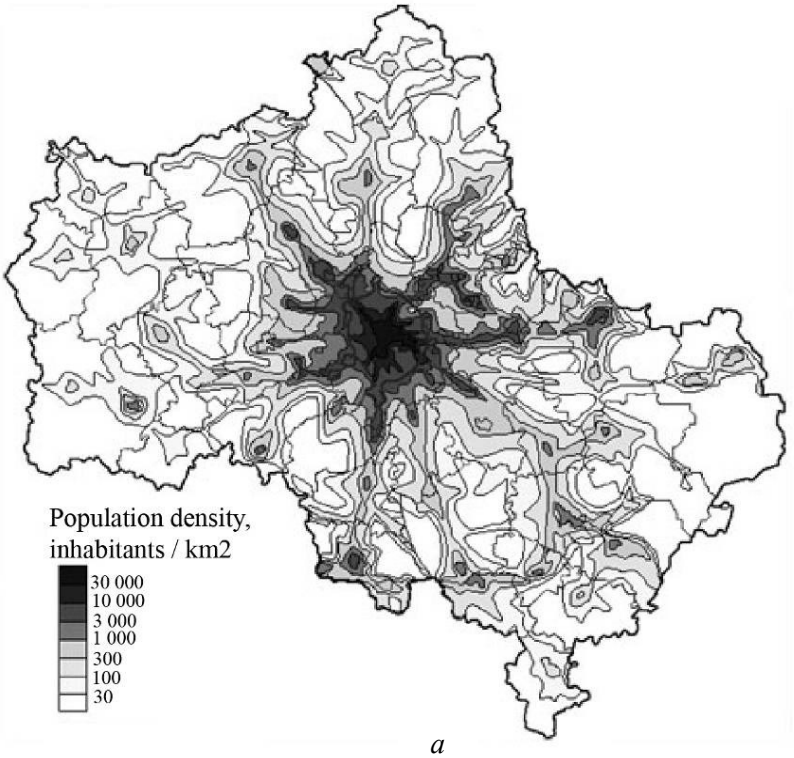


Fig. 6. Space-time displacement and «fading» of urbanization impulse in Europe by G.Petrishin (*a*) and by V.Samarkin (*b*)

undulatory event of multi-level development of population-environment ETPS in ecological space city-region (see Fig.7) [8, 18, 19].

So, cities which are gradually compacting population and expanding borders and areas of influence of urbanized territories, on one hand, perform the function of accelerator of development, but on the other hand, act as the brake of processes of population increase, since at conditions of over-compacting the decrease of birth rate occurs and, as a consequence, the aging of population, increase of death rate and decrease of population number [20].

9. The space is absolute in new physics. There is no and could not be endless straight lines in this space in the closed rotational universe (inside the sphere) and all motion is accelerated only. Similarly, in our research a stable development is not only a linear process of constant number increase (attributable only for initial component of the wave, see Fig. 2, stage I), but oscillatory process of continuous change of accelerations and qualitative conditions. Straight and curve in physics of single field are combined into one and micro-world is closed with macro-world.



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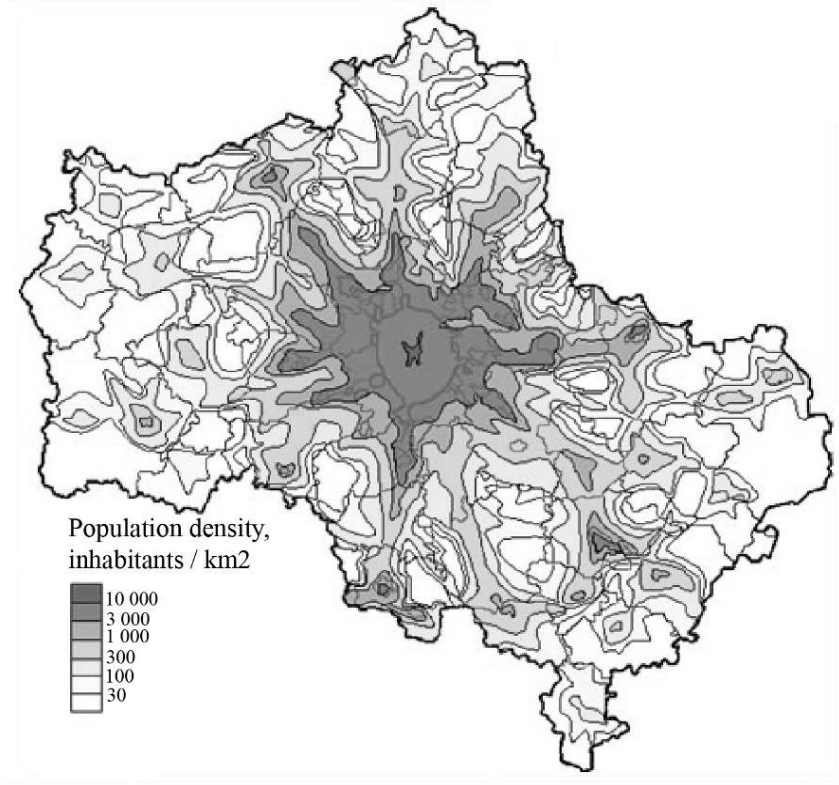

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Fig. 7. Season-daily «pulsation» of density of population in Moscow agglomeration: in winter working day (*a*) and summer day-off (*b*) by A.Makhrova, T.Nefedova, A.Traywish

A similar concept is also found in «urban physics» in which «straight» corresponds to the striving of ETPS to the goal which the condition of ecological balance is (see Fig. 2, stage *VI*), and «curve» corresponds to wave of its oscillatory development (see Fig. 2, 6). Connection of micro- and macro worlds in «urban physics» is an action of all the, known at the time, fundamental physical interactions [2, 3].

10. The physics of absolute to some extent reminds past representations of people about the world. However, there is a difference between an early absolute which is a passive absolute, and a future absolute which is a knowing and active one. This is the absolute of different levels, whereby any process is fractured gradually: absolute → relative → absolute-dot. Our research belongs to transient stage «relative → absolute-dot». Passive apprehension of the world did not require the presence of an observer, since he did not decide about anything. Then the observer was introduced into the system of apprehension, as a counter-balance to an event and a part of relative. Finally, an observer is not required again since he is an active component of observer-event. From this point of view the observation «from outside» has lost its sense. In this sense, the idea of V. Vernadsky concerning the transition of biosphere into anthroposphere is valid– the condition of Nature is driven by human mind and it could be expressed in such a way: the mankind required to learn management, thoughts and activity rather for themselves than by Nature.

CONCLUSIONS

1. The physics of non-absolute allows looking at laws by eyes of investigated object, from the side of event itself without changing laws but discovering them under another angle of view and from another level of system integrity. The consequence of this physics is development of new theory of systems. As a result, the unduly genetics was born as well as ethnic prognostics which are comparatively new branches of knowledge, attributed by active interdisciplinary integration. Within the given context the following disciplines have been developed: Genrich Altshuller (Theory of Inventive Problem Solving), Rohn Habbard (Dianetics) and Lev Gumilev (Theory of Passionarity) [6].

2. The main represented principles of «urban physics» of ecological space give reason for learning of a new branch of the science of town-planning, i.e. wave urbanistics – the science of management by unduly process of territories development in order to provide sustainable development of society in the direction of restoration of positive system changes taking into consideration the abilities of the territory (single field and ecological space) to self-arrangement at the level of cities and self-regulation at the level of regions. The leading sections of unduly urban planning could be «town-planning theory of stability», «urban physics of ecological space» and «ecological and demographical prognostics». Here we can remember the phrase of the German philosopher H. Hesle according to which at conditions of ecological crisis the key science which is able to save the environment of mankind existence is urbanistics [21].

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ТЕОРЕТИЧЕСКИЕ ОСНОВЫ ВОЛНОВОЙ УРБАНИСТИКИ

Аннотация. Установлено, что все законы в Природе имеют единую основу – закон сохранения мощности. В философии этот закон известен как принцип «изменяемости неизменного», в экологии – как закон экосистемной саморегуляции, согласно которому, в условиях недонаселенности территории численность населения растет, а в условиях перенаселенности – снижается. Отмеченное свойственно и динамике развития урбанизированных территорий, как эколого-градостроительных систем. Выявлено, что в развитии этих систем в определенной мере проявлены все четыре вида физических взаимодействий. На основании полученных результатов сформулированы основные положения «урбофизики» экологического пространства, содержание которых согласовано с постулатами новой физики единого поля (бишкекская версия), что закладывает теоретические основания для появления нового направления в градостроительной науке – волновой урбанистики.

Ключевые слова: урбанистика, устойчивое развитие, экосистемная саморегуляция, экологическое равновесие, демографическая емкость, эколого-градостроительные системы.