

11. Фашевський М. І. Методологічні аспекти дослідження географії населення / М. І. Фашевський // Укр. геогр. журн. / Ін-т географії НАН України. – К., 2004. – № 3. – С. 58–62.
12. Шевчук Л. Т. Соціальна географія : навч. посіб. / Л. Т. Шевчук. – К. : Знання, 2007. – 349 с.
13. Юрківський В. М. Аналіз умов життя населення конкретної території / В. М. Юрківський // Економічна та соціальна географія – К. : Київський держ. ун-т ім. Тараса Шевченка, 1992. – № 44. – С. 32–35.

Барский Юрий, Фесюк Василий, Голуб Геннадий. Научный опыт общественно-географических исследований «качества жизни» и «жизнедеятельности населения» как ключевых категорий социальной региональной политики. Раскрыта сущность категорий «качество жизни населения» и «жизнедеятельность населения» региона как объектов общественно-географических исследований. Определены главные направления социальной региональной политики в плоскости обеспечения качественного уровня процессов общественной жизни и деятельности населения. Охарактеризованы способ и уровень жизни. Изучен научный опыт отечественных и западных специалистов в исследовании качества жизни и жизнедеятельности населения. Проанализированы методологические основы и механизмы многомерного сравнительного анализа качества жизни населения и его жизнедеятельности. Рассмотрены показатели, характеризующие условия жизни населения на конкретной территории.

Ключевые слова: жизнедеятельность населения, качество жизни населения, региональная политика, общество, регион.

Barsky Yuriy, Fesyuk Vasil, Golub Gennady. Scientific Experience of Socio-Geographical Research of Population Life Quality and Vital Functions as Key Categories of Social Regional Policy. The essence of categories regional «quality of life» and «vital functions» as objects of social and geographical research are studied. The basic directions of social regional policy in order to ensure quality level of social life process and vital functions of the population are revealed. Method and standard of living are studied. Scientific experience of local and western experts in the research of quality of life and vital functions of the population are observed. Methodological framework and mechanisms of multidimensional comparative analysis and quality of life and vital functions of the population are analyzed. Indicators describing the living conditions in a particular area are studied.

Key words: vital functions of people, quality of life, regional policy, society, region.

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The Specifics of Modeling Methods Using in Countrystudies Researches

The main aspects of theoretical approaches to modeling and models usage in country-studies researches are revealed. Features of modeling methods use in modern country-studies research are studied. The main functions and tasks of modeling of country-studies objects are analyzed. Classification of models for various qualities is generalized and the possibility of their use for description and research of various country-studies processes and phenomena are proposed. The specificity of modeling techniques use in country-studies is investigated. Main problems and shortcomings of spatial processes and phenomena modeling based on existence of standard models in country-studies research are analyzed. Main perspectives of modeling development in the study of spatial phenomena and dynamics of regional processes are revealed.

Key words: modeling, model, methods of research, country-studies research, country-studies model.

Formulation of Scientific Problem and its Importance. At the present stage of development of the countrystudies paradigm a variety of methods and techniques of research are often used, among which mathematical statistics take a prominent place, as an interdisciplinary method. They are used to express the qualitative properties of investigated countrystudies sites and the dynamics of their development in the quality sign and in general to determine the state of countrystudies situation on a particular territory. One of the most

common mathematical techniques which are often used in modern country studies researches is modeling. This method is based on the study of models of existing objects and apparitions, as well as the anticipated (constructive) objects [5].

Model (lat. *modulus*) – analogue, substitute some of the original object (the event, process, phenomenon) another object that under certain circumstances displays the properties of the original [9]. Model – the system that displays the specified properties and options, connection, object of study. The modeling process is the construction of model of the researched object. Nowadays the development of scientific country studies researches of the modeling process provides an opportunity to establish more fully relationships with individual parts of the studied country studies objects and to identify general trends and processes and apparitions of spatial development. Carrying out comprehensive and partial country studies researches using a systemic approach often requires the specification of development of the object and evaluation of its dynamics and interactions with other components of the territory. Therefore, in such researches, the most comprehensive and successful on our scientific view is to use methods of modelling that requires a scientific generalization.

The Analysis of Researches of this Problem. Modeling in country studies researches has found widespread usage in the 60-ies of the twentieth century, when the western and national scholars have started to use mathematical models [3]. In particular, publication of American, British and Soviet scientists were the most common, such as in Y. Pragi [12], [13] P. Haggeta, J. R. Chorli [14], V. Stoff [15], V. Hurman and I. Druzhinin [10], H. Shvebs etc. There are publications concerning modeling economic processes in scientific literature (M. Buslenko, S. Yermakov, G. Mikhailov, A. Bakayev, N. Kostina, M. Yarovickij, O. Sharapov etc.), and the modeling of complex systems and cybernetic analysis processes (I. Novick, K. Morozov, A. Umov, O. Moroz, L. Rastrigin, V. Markov etc.). O. Shablji and O. Topchiev considered the possibility of using mathematical-statistical methods and modeling in particular in economic and geographic studies. There are modern publications relating to modelling of geographic images (D. Zamyatin [3; 4]), and methods of teaching geography with the usage of methods of modeling (L. Vishnikina [1; 2]) as well as modeling of spatial systems and processes (R. Kvietnyy, I. Bohach, O. Boyko, O. Sofina, O. Shushura [5]) etc.

In the 80-ies of the XX century in the Moscow edition of «Voprosy geografii» series of scientific works were published, and they were devoted to the modelling of geosystem [11]. Some aspects of the modeling methods usage in country studies were discussed in textbooks of Y. Mashbica [7], M. Myronenka [8] and P. Maslyak [6]. However, a clear scientific picture about the modeling methods usage in modern country studies researches while in the scientific world has not been formed, which led to the choice of the theme of this article.

The aim of the article is to study the features of modeling methods usage in modern country studies researches. The main objectives of the article are: to describe the modeling methods, which are used in modern country studies researches, to figure out the main directions of modeling methods usage in different country studies spheres and stages of conducting country studies researches.

The Main Material and Justification of the Results of the Study. Modeling process necessarily includes the creation of abstraction as well as logical inferences by analogy and the construction of new scientific hypotheses. The main feature of the modeling is method of cognition based on the study of some objects with other objects-substitutes. The model acts as a kind of instrument of cognition, which the researcher puts between the object and himself, and by which the researcher studies the processes and apparitions. This feature of the modeling method determines the specific forms of abstraction usage, analogies, hypotheses and other categories and methods of cognition. The need to use the modeling method is defined by the fact that many of the objects (or problems relating to these objects) are difficult or impossible to investigate or they require additional material, time and resource costs. Modeling process involves the establishment of a correspondence between the model and the original, so it becomes more effective when obviously based on systematic idea about the object and its model.

Therefore, the model is a simplified reproduction of reality, which reflects in a generalized form of its essential properties. Models can be physical, analog and mathematical. In the country studies researches the modeling process is seen as a sophisticated and comprehensive tool for the exploration of the object by creating formally same informative images (models) that display certain properties of the object of study, which provides a wide range of specific methodological tools, the main of which is the system approach [10].

Modeling process in country studies is based on a logical principle of invariance (analogies). It allows person to examine country-specific objects that are sometimes difficult to explore, through the consideration of other, similar, and the more available to the original objects (models). A model is a simplified (sometimes reduced with

the help of the scale) version of reality which probably reflects in the generalized form of its essential features and correlations of country studies objects. The scientific models are used for accumulation and organization a significant array of information on various aspects of spatial development.

Models in the country studies researches provide a variety of functions:

- 1) gnoseological – creation of theories and knowledge of laws of spatial development processes;
- 2) cumulative-empirical – the definition of the required information, its collection and systematization;
- 3) analytical – detailing, identification and explanation of the mechanisms of development of a particular spatial phenomena;
- 4) organizing – consideration of reality as a totality of interconnected systems;
- 5) predictive – predictions of the development of spatial processes and phenomena in the future;
- 6) selective – the opportunity to study those spatial objects, processes and phenomena that are difficult to explore by other methods;
- 7) constructive – implementation of the specific research tasks;
- 8) management – manage the research process and ensure management decisions;
- 9) informational – to promote scientific ideas and background research information, etc.

Modeling in country studies includes a number of interrelated stages: 1) setting the problem; 2) collecting and processing the necessary information; 3) development and creation of models; 4) the scientific study and analysis of the model as a source of new information; 5) extrapolation of data obtained from the model to the object of knowledge; verification of the model, which is based on praxeological assessing of the suitability and viability models [12].

The main goal of modeling in country studies researches is revealing the conditions of formation, functioning and development of local systems and their interaction with the natural environment due to the forecast of further development. The foundation of any science is theoretical models. From the standpoint of regional geography and theory analysis, the study of the relations between nature and society can be reduced to the development of conceptual model of the interaction of complex industrial and territorial control systems and self-regulating natural ecosystems. In modern country studies researches modelling is the most often used for solving such scientific tasks as [4]:

- 1) education and study of the factors of territorial organization of nature and society;
- 2) research of structure and functional dependencies between components, that explains the nature of intra-system connections and form behavior;
- 3) consideration of the dynamics of local systems at different stages of their development;
- 4) detection and quantitative evaluation of the relationships between components inside the territory of the system and between the system and the environment;
- 5) development of integral indices of sustainable operation and development of territorial systems that are influenced by different factors;
- 6) study of the most significant properties of natural territorial and economic systems – productivity, sustainability, stability, responsiveness, etc.;
- 7) evaluation of the degree of anthropogenic effects on the natural system;
- 8) conducting of spatial zoning and typing territorial systems;
- 9) study the dynamics of regional as a whole and its individual elements;
- 10) forecasting the development of different areas in the future;
- 11) the management area of scientific evidence and regions of different levels, etc.

One of the most important tasks of the modeling is a generalized application (a simplified representation of the object). When modeling the explorer always tries to abstract from minor details in this regard subject. However, this simplification is slightly different from the other kind of disregard consideration of secondary properties of the current situation development, which is inherent in any scientific acceptance, since the main objective of modeling in this case is to show the structural form and the main content of the related object, but not its properties and interrelations with other elements of the territory [10].

In addition, many models are quite similar to the original in their graphic image. However, the forms of the models are not always realistic in actual playing and respect to their content and features. So, for example, map projections and scales are displayed with conventional signs the real value, that describes the status of the study of country studies objects but the ways of transmission are not real forms of the phenomenon. Therefore, the difference between the model and the real situation involves only the limits of possible assumptions to simplify

object modeling, without losing the invariance methods simulation [14]. Thus, the model is simplified support system - its methodological design of country to study the object, not an end in itself of scientific research. Most models are created precisely in order to give reliable information about the object of study and must be in a specific compliance and they describe the specific functional regularities and mathematical expressions. Therefore mathematical modeling in country studies is the most accurate.

Mathematical modeling is the methodological procedure which puts the approval on a particular standard or problem in country studies situations or phenomena in math, with subsequent analysis of this problem through mathematical mean [11]. The ultimate goal of creating mathematical models is a set of functional dependencies between variables and parameters. The variable in this case is seen as a particular mathematical magnitude, which studied the problem and can take different values. The parameter is a mathematical magnitude, which keeps the same value in the researched problem. The difference between the variable and the parameter is relative, because the value, that is constant in the study of one problem can be variable in another statement.

Function is conformity between changeable at which each value of one of them (the argument, the independent variable) is defined by the value of another variable (the dependent variable) [5]. Such compliance may be given as a formula, a graph or a table. A mathematical expression is the set of finite sets of variables, parameters, features, combined by mathematical operators. All models, which are virtually used in country studies researches, can be divided into two classes: the material and the ideal [10].

Material models are objective in their form and content. The ideal model is the objective within the meaning of (reflecting the actual reality), but the subjective form (only exist in the minds of people and operate according to laws of logic). Among the ideal models can be distinguished: visual (scheme; map; drawing; graphics; hypotheses; presenting; analogy), the iconic (characters; the alphabet; arranging; topological graph; description; network representations), math (structural; functional; analytical; numerous; simulation). Structural models reproduce the composition elements of country studies objects, processes and phenomena and help to understand the relationship between them, i.e. reflect the structure of an object related to modeling [12]. These models reproduce the value of local processes and are often used in theoretical country studies researches or study component and territorial structure of the object, in the form of diagrams, drawings, descriptions and tabular material. Functional models simulate the way of the original object's behavior, its functional dependence on the external environment. Their usage is associated with the study of the functional structure of the country studies objects, their relationships, as well as factors of development of the territory and the spatial processes. Analytical models allow the person to receive explicit dependencies of necessary values of variables and parameters that characterize the observed spatial processes and phenomena.

Analytical solution of mathematical ratio is a general description of the study of country studies objects. Their usage in the country studies is mostly illustrative (in the form of charts, graphs, cartograms and other cartographic material and the most maps etc.). They are created as a result and an illustration of the results of the study as summarized structural-analytical scheme of study or conceptual mathematical model in the form of functional relationships that are built as a result of significant procedures of mathematical calculations and use a variety of computational mathematical methods (factor analysis, clustering, a method of correlation and regression analysis, functional dependencies, etc.) [5]. Mostly such models are applied in industry of country studies researches.

Numerical models are characterized by the fact that the value of the required quantities to conduct country studies researches can be obtained as a result of the application of quantitative methods. In most cases, creating such models involves the calculation of index of indices (coefficients and indexes, as well as indicators of the level of territorial concentration or localization or differentiation) development of the territory, the calculation of the provision and levels of development of the country (and labour-resource potential of the territory; the share of industry in the total manufacturing process; the level of provision of resources; shows indicators of production, etc.) and the areas of operation of the production, etc. [3]. All quantitative methods allow you to receive only partial information about the values, so that its implementation would require a task of all the parameters of the mathematical ratio. Such models are presented mainly in matrix form (in the form of tables, ratings, scalar records, etc.) and represent a mathematical value or rate of development of the territory (the process, phenomenon). They are used at the stage of information processing array of country study and presentation of research results as factual arguments and evidence of the results of country studies research. Simulation models are realized with the computer help in the form of modelling algorithms (programs) that allow the calculation of the value of the source characteristics and determine a new condition, where the model is with

the given values of the input variables, parameters and initial condition model [5]. Mostly such models are standardized and are implemented with the help of software. They can be used in the construction of the previous kinds of models, but quite interesting and promising in the country studies researches is the so-called virtual models that use the gaming scenario methods (game theory, a cinematographic technique, methods of simulation theory, predictive techniques etc.). The logical model levels are divided into macro- and mikromodels. Macromodeling – is usually the abstract and comprehensive understanding of the processes. Micromodeling is a representation of the individual details of the phenomenon or the concentration of attention on some parts of the process [9].

The methods of constructing models are divided into: manual, that are created without the use of computer or other means; analog, that are constructed with special electronic devices; computer, that are based on the use of computer equipment and software, as well as mixed. As experience shows, the most suitable for display of country studies processes in complex interactions are computer models that represent the description of processes using artificial languages based on special programs. For the behavior in the time the models are: dynamic (time plays the role of the independent variable, and object behavior modeling changes over time); static (object behavior modeling does not depend on time); quasi-static (object behavior modeling changed from one of static state to another according to external influences). If the elements of the mathematical model are enough defined and the behavior of object modeling can be determined exactly, so such model is deterministic, in the opposite case – stochastic [4]. If the parameters and variables of the model are continuous values, the mathematical model is continuous, in the opposite case is discrete. The mathematical model can have linear or non-linear mathematical expressions. Mathematical models of international relations are usually dynamic, stochastic, discrete and non-linear [10].

Depending on the problem of research in the mathematical modeling in country studies such mathematical apparatus is used: equations (algebraic, transcendental, differential); methods of approximation (interpolation, extrapolation); optimization techniques (structural and parametrical optimization, optimization on graphs and networks); methods of analysis of stochastic systems (theory of probability, mathematical statistics, planning experiments theory, game theory, systems of mass service); algebra of logic; theory of machines; theory of algorithms; information theory, etc. [5].

All mathematical models can be conditionally divided into three interrelated groups: 1) deterministic models, that are presented in the form of equations and inequalities, that describe the behavior of the system which is being studied; 2) models, which contain the expression that you want to maximize or minimize; 3) probabilistic models that are expressed in the form of equations and inequalities, but have random content, i.e. the search for solutions based on maximizing the average utility [13].

For a long time the main obstacle to the practical application of mathematical modeling in country studies was content filling of developed models with specific content and quality information. The accuracy and completeness of the initial information, the real possibility of its collection and processing in many respects determine the choice of types of applied models. On the other hand, a study of the simulation of the territorial systems imposes new requirements to the system information. Depending on the simulated object and purpose of the models used in their initial information is substantially different nature and origin. It can be divided into two categories: previous development, current status and future development of objects, including data on expected changes to their internal parameters and external conditions (predictions). The second category of information is the result of independent studies, which can also be carried out using the simulation. Many spatial processes are characterized by regularities that can be found only on the basis of a large number of observations [4].

The study of country studies objects and phenomena gives an opportunity to use a wide variety of models. However, in the process of modelling there are often substantial difficulties with the fact that the model is a general simplification of the real system-shaped structural frame which is fixed at a particular stage of its development. Therefore, it cannot completely explain the reason of dynamics and general behavior of real objects in space and time and in most cases only represents some part of the actual functioning of the system and certain visible trends. As for interconnections and mutual influence of the country studies objects, and especially the condition of dynamism in these processes, the models cannot always correctly reflect the status of the real situation of the objects and require constant specification and refinement that is not typical for stable models, and this situation is non-dynamic [15]. Another difficulty of the modeling techniques usage is in selecting the right method of constructing models, which on one hand requires simplification of the filing of the structural elements, and on the other hand it takes into account all the features and trends of development in the complex interaction

of spatial and temporal phenomena that allows better interpretation of the results. Mathematical models cause great difficulties associated with many original and heterogeneous information used in their construction. As a result, many models have certain disadvantages: 1) incorrect description of the real country studies situation; 2) render the naivety, which leads to loss of detail that is necessary for the understanding of the situation and dynamics of the development of the related object; 3) goal looks like it have formulated after the construction of models; 4) inadequate perception of the statistical characteristics of the values generated by the model; 5) hypotheticality of the modeling process, which is often not aware of the real processes of spatial interaction and the influence of anthropogenic and other factors, including the spontaneity and revolutionary in society and the natural environment, etc.

Other difficulties are caused by the peculiarity of the math that has evolved over many centuries, mainly in connection with the needs of physics and engineering. But the main reasons for this are in the nature of the country studies objects and processes and in the specifics of the study of spatial patterns. The main object of the country studies research is a territorial natural and socio-economic systems that are in line with the cybernetic notion related to complex systems.

An important feature of any system, including regional, is emergence – the presence of such qualities is not inherent in either one of the elements in the system. Therefore, the understanding of the functioning peculiarities of these systems is not enough studied just individual elements. Complexity of the system is determined by the amount of input into it elements, relationships between these elements, as well as the relationship between the system and environment. Territorial complexes have all the signs of a very complex system. They combines a number of elements of different varieties of internal relations and communications with other systems (environment, economy, population, etc.). In the national economy natural, technological, and social processes, the objective and subjective factors are interacted, that causes difficulties of their evaluation and construction of comprehensive model of this interaction in dynamics.

According to experts' opinion, often the complexity of the territorial systems was viewed as a justification for the impossibility of the modeling and studying with mathematical methods. However the model can be the object of any nature and any complexity. The last one makes the greatest interest for modeling. Modeling of such complex processes of spatial interaction can give such results that the person can't get in other ways. The opportunity of mathematical modeling of any spatial objects and processes does not mean successful feasibility and depends on the level of country studies and mathematical knowledge, existing information and computer technology. In addition, always there are some problems that are not amenable to formalization and in this case the mathematical modeling will be insufficiently effective.

Conclusions and Perspectives for Further Researches. Thus, the usage of methods of modeling in country studies allows the researcher to assess the major scale, proportion and spatial dynamics of interaction and development of territorial systems. Due to the modeling of country studies analysis and prediction of chronological processes the researchers can identify dynamics of territorial objects, but also to develop the right strategy of making management decisions on rationalization and improvement of functional and territorial structures of the elements of the socio-political and economic improvement. The modeling creates a practical base for the estimation of real situations in space and time for the implementation of the invariance of situation development and is based on the selection of the best management options for rationalizing the usage of resources, which need further scientific research.

Sources and Literature

1. Вішнікіна Л. П. Моделювання у навчанні географії / Л. П. Вішнікіна // Географія в інформаційному суспільстві : зб. наук. праць : у 4-х т. – К. : ВГЛ Обрії, 2008. – Т. IV. – С. 333–335.
2. Вішнікіна Л. П. Теоретичний аспект застосування навчального моделювання в шкільній географії / Л. П. Вішнікіна // Географія та основи економіки. – 2007. – № 6. – С. 31–34.
3. Замятин Д. Н. Культура и пространство: моделирование географических образов / Д. Н. Замятин. – М. : Знак, 2006. – 488 с.
4. Замятин Д. Н. Моделирование географических образов: пространство гуманитарной географии / Д. Н. Замятин. – Смоленск : Ойкумена, 1999. – 256 с.
5. Комп'ютерне моделювання систем та процесів. Методи обчислень : навч. посіб. – Ч. 1 / Р. Н. Кветний, І. В. Богач, О. Р. Бойко [та ін.] ; за заг. ред. Р. Н. Кветного. – Вінниця : ВНТУ, 2012. – 193 с.
6. Масляк П. О. Країнознавство: підручник / П. О. Масляк. – К. : Знання, 2008. – 292 с.
7. Машбиц Я. Г. Комплексное страноведение / Я. Г. Машбиц. – М. : Смоленск : Изд-во СГУ, 1998. – 264 с.

8. Мироненко Н. С. Страноведение: теория и методы : учеб. пособие для вузов / Н. С. Мироненко. – М. : Аспект Пресс, 2001. – 268 с.
9. Модели в географии : сб. ст. / под ред. П. Хаггета, Дж. Р. Чорли. – М. : Прогресс, 1971. – 384 с.
10. Модели природных систем / под ред. В. И. Гурмана, И. П. Дружинина. – Новосибирск : Наука, 1978. – 224 с.
11. Моделирование геосистем // Вопросы географии. – М. : Мысль. – 1986. – Вып. 127. – 215 с.
12. Праги У. Общие основы формализации интерпретации моделей в географии / У. Праги // Теоретическая и математическая география : сб. очерков. – Таллин : Валгус, 1978. – С. 123–148
13. Хаггет П. География: синтез современных знаний / П. Хаггет. – М. : Прогресс, 1979. – 684 с.
14. Чорли Дж. Модели в географии / Дж. Р. Чорли, П. Хаггет. – М. : Прогресс, 1971. – 384 с.
15. Штофф В. А. Роль моделей в познании / В. А. Штофф. – СПб. : Наука, 1963. – 128 с.

Патійчук Віктор, Саванюк Андрій. Специфіка застосування методів моделювання в країнознавчих дослідженнях. Виокремлено головні аспекти теоретичних підходів до моделювання та використання моделей у країнознавчих працях. Розглянуто особливості застосування методів моделювання в сучасних країнознавчих дослідженнях. Визначено основні функції та завдання моделювання країнознавчих об'єктів. Узагальнено класифікацію моделей за різноякісними ознаками й показано на можливості їх застосування під час опису й дослідження різноманітних країнознавчих процесів та явищ. Досліджено специфіку використання методів моделювання в країнознавстві. Указано на основні проблеми й недоліки моделювання просторових процесів і явищ з огляду на існування типових моделей у країнознавчих працях. Показано головні перспективи розвитку моделювання у вивченні просторових явищ та динаміки територіальних процесів.

Ключові слова: моделювання, модель, методи дослідження, країнознавчі дослідження, країнознавча модель.

Патийчук Виктор, Саванюк Андрей. Специфика использования методов моделирования в страноведческих исследованиях. Выделяются главные аспекты теоретических подходов к моделированию и использованию моделей в страноведческих исследованиях. Рассмотрены особенности использования методов моделирования в современных страноведческих исследованиях. Определены основные функции и задания моделирования страноведческих объектов. Обобщена классификация моделей за разнокачественными признаками и выделены возможности их использования при описании и изучении разнообразных страноведческих процессов и явлений. Изучена специфика использования методов моделирования в страноведении. Раскрыты основные проблемы и недостатки моделирования пространственных процессов и явлений с точки зрения существования типичных моделей в страноведческих исследованиях. Показаны главные перспективы развития моделирования в изучении пространственных явлений и динамики территориальных процессов.

Ключевые слова: моделирование, модель, методы изучения, страноведческие исследования, страноведческая модель.

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