

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
O.M. BEKETOV NATIONAL UNIVERSITY OF URBAN ECONOMY
IN KHARKIV**

MONOGRAPH

GUANGDONG OCEAN UNIVERSITY

WEN MINGMING

**MAMONOV KOSTIANTYN ANATOLIYOVYCH
GRYANYK VOLODYMYR OLEKSANDROVYCH**

**INTELLECTUAL GEOSPATIAL ECONOMY
OF COASTAL REGIONS: INFORMATION ASPECT**

Kharkiv – 2023

Reviewers:

O. V. Dymchenko, Doctor of Economics, Professor, Head of the Department of Entrepreneurship and Business Administration O. M. Beketov National University of Urban Economy in Kharkiv;

Yu. M. Palekha, Doctor of Geographical Sciences, Professor, Deputy Director for Science - Head of the Center for Geographic Information Technologies of the State Enterprise Ukrainian State Research Institute for Designing Cities of the «Dipromysto» named after Y. M. Bilokhina;

A. G. Batrakova, Doctor of Technical Sciences, Professor, Head of the Department of Road Design, Geodesy and Land Management of the Kharkiv National Automobile and Road University.

MingMing Wen , Mamonov K. A., Gryanyk V. O.

M81 Intellectual Geospatial economy of coastal regions: information aspect: monograph. – Kharkiv: Publ. «PhPB Panov A. N.», 2023. 540 p.

ISBN 978-617-8113-53-7

The monograph focuses on the formation of theoretical aspects of the intellectual geospatial economy of maritime regions, identifies the features of land use, focuses on ensuring the identification of objects and the use of modern geographic information systems. A method for estimating the level of information support of the intelligent geospatial economy of marine regions is proposed. Substantiated recommendations for the creation and implementation of information support for the intelligent geospatial economy of maritime regions. The work can be used by students, graduate students, scientists, practitioners and other stakeholders working in the field of formation and implementation of economic and land relations, regional management, cadastre and real estate.

Acknowledgement. This monograph is supported by the project of Guangdong philosophy and Social Sciences "13th five-year plan" 2020 project (GD20XYJ10), by the project of Enhancing School with Innovation of Guangdong Ocean University's (080507112201 and 230420023), by the project for scientific research start-up funds of Guangdong Ocean University (R20067) and by the project of Humanities and Social Sciences Research Program of Guangdong Ocean University (C22839).

UDC 332.2:332.3:349.4

У монографії акцентовано увагу на формуванні теоретичних аспектів інтелектуальної геопросторової економіки морських регіонів, визначено особливості землекористування, акцентовано увагу на забезпеченні ідентифікації об'єктів та використанні сучасних геоінформаційних систем. Запропоновано метод оцінки рівня інформаційного забезпечення інтелектуальної геопросторової економіки морських регіонів. Обґрунтовано рекомендації щодо створення та впровадження інформаційного забезпечення інтелектуальної геопросторової економіки морських регіонів. Робота може бути використана студентами, аспірантами, науковцями, практиками та іншими зацікавленими особами, які працюють у сфері формування та реалізації економічних і земельних відносин, регіонального управління, кадастру та нерухомості.

CONTENT

INTRODUCTION	8
SECTION 1. INTELLECTUAL GEOSPACE ECONOMY OF COASTAL REGIONS: THEORETICAL ASPECTS	13
1.1 Definition of intellectual geospatial economy of coastal regions	13
1.2. Elements of the intellectual geospatial economy of coastal regions.....	14
1.3 Hardware and information model of the geospatial economic system of coastal regions	28
SECTION 2. INFORMATION SUPPORT OF INTELLECTUAL GEOSPATIC ECONOMY OF COASTAL REGIONS IN THE CONTEXT OF LAND USE	37
2.1. Analytical review of the current state of land use in coastal regions.....	37
2.2. Trends in the development of cadastral systems of registration and accounting of real estate as a key element in the formation of information support for intelligent geospatial economy: world and domestic experience	46
2.3 Analysis of the composition of information about real estate in the modern multi- purpose cadastre in the formation of an intelligent geospatial economy of coastal regions	53
SECTION 3. DIRECTIONS AND FEATURES OF DEVELOPMENT OF INTELLECTUAL GEOSPATIAL ECONOMY OF COASTAL REGIONS ON THE BASIS OF FORMATION OF IDENTIFICATION SYSTEM.....	61
3.1 Fundamentals of real estate identification for the intelligent geospatial economy of coastal regions	61
3.2 Analytical review of the state of identification of real estate in European countries for the formation of an intelligent geospatial economy of coastal regions.....	66

3.3 The state of identification of real estate in Ukraine for the formation of an intelligent geospatial economy of coastal regions	69
3.4 Development of real estate identification systems for the formation of intelligent geospatial economy of coastal regions: an analysis of existing methods	72
SECTION 4. ASSESSMENT OF THE LEVEL OF INFORMATION SUPPORT OF THE INTELLECTUAL GEOSPATIC ECONOMY OF THE SEA COASTAL REGIONS FOR IMMOVABILITY OF CAPACITY	92
4.1 Identification of real estate for the formation of information support of intelligent geospatial economy on the basis of multi-purpose cadastre	92
4.2 Integrated method for assessing the level of information support of the intelligent geospatial economy by determining the use of real estate in the multi-purpose cadastre system.....	108
4.3 Assessment of the reliability of the developed models of the level of information support of the intelligent geospatial economy based on the use of real estate multi-purpose cadastre by the method of k-means McKean	133
SECTION 5. SCIENTIFIC SUBSTANTIATED RECOMMENDATIONS FOR FORMATION OF INFORMATION SUPPORT OF INTELLECTUAL GEOSPATIONAL ECONOMY ON THE BASIS OF USE USER.....	142
5.1 Structural and functional model of information technology support for the identification of real estate for the formation of the information basis of the intellectual geospatial economy	142
5.2 Conceptual model of the database of property identifiers of real estate to ensure the development of intelligent geospatial economy	150
5.3 Functional model of web service of formation of thematic identifiers of real estate objects to ensure the development of intelligent geospatial economy	160

5.4 Functional model of web service of decoding of complex identifiers of real estate objects of formation of intellectual geospatial economy	170
5.5 Development of scientifically sound recommendations for information support of intelligent geospatial economy based on the use of real estate multi-purpose cadastre	175
CONCLUSIONS	509
REFERENCES	517

Chapters written by Wen MingMing are section 2, section 4, section 5 and Reference.

Chapters written by Mamonov Kostiantyn, Gryanyk Volodumur are introduction, section 1, section 3 and conclusions.

Wen Mingming, Ph.D, Associate Professor. She is currently an Associated Professor in institute of Management of Guangdong Ocean University. She got a doctoral position in O. M. Beketov National University of Urban Economy in Kharkiv. She has published more than 40 papers and Undertook 4 projects as the project leader.

Institute of Management, Guangdong Ocean University, 1 Haida Str., Zhanjiang, Guangdong Province, People's Republic of China, 524088.

Mamonov Kostiantyn, Doctor of Economics, Professor of the Department of Land Administration and Geo-information Systems (GIS). Expert in the field of research on the efficiency of land use and resources, land management, cadastre, land administration, territorial development, economic and technical sciences. The expert has more than 20 years of experience in scientific and pedagogical work in the Free Economic Zone, including more than 17 years of pedagogical work. The total number of articles in journals and collections of scientific papers, which are referenced in scientometric databases – 110. Head of 3 scientific schools: Mathematical modeling in the processes of land administration and territorial development; Territorial development of land use; Geospatial modeling and geofactor analysis.

O. M. Beketov National University of Urban Economy in Kharkiv, address: 17, Marshal Bazhanov Street, Kharkiv, 61002, Ukraine.

Gryanyk Volodymyr, Ph.D. Senior Research Fellow of the Institute for Expertise, Design and Research of the Dnieper Research and Educational Institute of Innovative Technologies in Construction of the Dnieper State Academy of Civil Engineering and Architecture, part-time director of Geoinfo. Author of more than 10 scientific and methodical works. Specialist in geodesy, land management, cadastre and geographic information systems.

Prydniprovsky Scientific and Educational Institute of Innovative Technologies in Construction of the Prydniprovsk State Academy of Civil Engineering and Architecture, address: 24a, Chernyshevskoho Street, Dnipro, 49600, Ukraine.

LIST OF SYMBOLS

IOB - the identifier of the construction object
KZD - identification code of the land plot
COB - the identification code of the construction object
KOH - the identification code of the real estate object
NON - the identification number of the real estate object
TZD - thematic identification code of the land plot
TOB - the thematic identification code of the construction object
TON - the thematic identification code of the real estate object
Ultrasound - a unique identification code of the land
UOB - a unique identification code of the construction object
UON - a unique identification code of a real estate object
API - Application Programming Interface
EAN - European Article Numbering
GUID - Globally Unique Identifier
OLC - Open Location Code
UBID - Unique Building Identifier
URI - Uniform Resource Identifier
URL - Uniform Resource Locator
URN - Uniform Resource Name
UUID - Universally Unique Identifier

INTRODUCTION

In the conditions of transformation processes, accumulation of negative influence of external and internal factors, there is a necessity concerning rethinking of approaches to maintenance of development of coastal regions. In this context, the development and implementation of intelligent geospatial economy, taking into account the areas of real estate use based on the formation of information support in the system of multi-purpose cadastre. Modern cadastral systems have a multi-purpose purpose and are aimed at the formation of information support for different groups of stakeholders, their use creates a basis for the protection and rational use of land resources, effective management of land relations. In modern conditions there is a transformation of land relations, the processes of formation of the land administration system are being implemented. The state of cadastral registration of real estate in Ukraine does not correspond to modern developed systems, normative monetary valuation of lands does not always characterize its real value, there is no ad valorem real estate taxation, geoinformation systems are insufficiently used. At the present stage of transformation of land relations, use of real estate there are problematic aspects of the formation of their information support. In particular, most of the data are non-uniform, unrelated, not tied to modern subjects and objects of land relations, the cadastral identification of real estate is insufficient. The multi-purpose cadastre is a modern information system that takes into account the multifaceted formation and use of real estate to meet the interests of different groups of stakeholders in coastal regions. During the years of Ukraine's independence, a multi-purpose cadastre, the use of which is based on modern European experience, has not been introduced into domestic practice. At the theoretical and methodological level, the conceptual apparatus for the formation and use of a multi-purpose real estate cadastre needs to be clarified, taking into account the peculiarities of domestic land relations in coastal regions. There is no information support for the use of real estate of the multi-purpose cadastre, which affects its development and implementation.

Scientists K. Arell, J. Arts, Y. Gubar, Y. Dekhtyarenko, R. Dzhivarelli, Y. Kirichek, M. Likhogrud, A. Lyashchenko, K. Mamonov, Yu. Mantsevich, M. Stupen, O. Tikhenko, V. Shipulin and others.

A significant contribution to the development of theoretical and methodological provisions for the development and application of information support in the use of real estate was made by: Yu. Karpinsky, S. Korostelev, D. Larson, A. Lizunova, A. Martin, S. Nesterenko, Y. Palekha, L. Perovych, O. Petrakovska, R. Plat, R. Taratula, A. Tretyak.

Theoretical and methodological approaches to the development and implementation of information support of real estate, the formation and use of multi-purpose cadastre are systematized in scientific research. However, further research is needed to create information support for intelligent geospatial economy, taking into account the peculiarities of the use of real estate multi-purpose cadastre with the definition of their identification, technical, technological, functional, legal, value characteristics, quantitative parameters, areas of geographic information systems.

Thus, the scientific and practical task of solving certain issues is relevant and forms the direction of research.

The aim of the work is to develop theoretical and methodological provisions and practical recommendations for the formation of information support of the intellectual geospatial economy of coastal regions, taking into account the peculiarities of the use of real estate multi-purpose cadastre.

To achieve this goal the following tasks are solved:

- to propose the definition of information support of the intellectual geospatial economy of the coastal regions, taking into account the peculiarities of the use of real estate of the multipurpose cadastre;
- to determine the directions and features of cadastral accounting and registration of real estate on the basis of harmonization of domestic practices to the European experience in the system of intelligent geospatial economy;

- substantiate the composition of the thematic identification code of real estate;
- substantiate the composition of the thematic identification code of real estate;
- to form methodical provisions for the identification of real estate in the multi-purpose cadastre as an important element of information support of the intellectual geospatial economy of coastal regions;
- propose the identifier of real estate by faceted classification method and parallel coding method depending on the type, composition, purpose of real estate;
- to develop an integrated method for assessing the level of information support of the intellectual geospatial economy of coastal regions, taking into account the peculiarities of the use of real estate multi-purpose cadastre;
- to offer scientifically substantiated recommendations on formation of information support of intellectual geospatial economy of coastal regions, taking into account directions of use of real estate objects of the multipurpose cadastre;
- to develop methodical provisions of thematic identification of real estate objects in the modern multipurpose cadastre;
- to forecast the integrated indicator of the level of information support of the intellectual geospatial economy of coastal regions in the system of multi-purpose cadastre.

The object of study - a set of interrelated processes that affect the formation of an intelligent geospatial economy of coastal regions, taking into account the peculiarities of the use of real estate.

The subject of research - theoretical and methodological provisions for the formation of information support of the intellectual geospatial economy of coastal regions, taking into account the use of real estate multi-purpose cadastre.

Research methods. The theoretical and methodological basis of the study consists of general scientific methods: comparison, generalization, systematization, methodology of formation of legal and information support of intellectual geospatial economy of coastal regions, taking into account the use of real estate multi-purpose cadastre. To obtain the results of the study, special methods were used: structural and substantive analysis - to form a conceptual apparatus for determining the information support of the intellectual geospatial economy of coastal regions, and taking into account the directions and features of real estate cadastral multi-purpose cadastre; identification methods - to develop and improve the system of identifiers of real estate in the system of intelligent geospatial economy of coastal regions; methods of expert and analytical analysis - to assess the level of indicators of the level of information support of the intellectual geospatial economy of coastal regions, taking into account the peculiarities of the use of real estate multi-purpose cadastre; mathematical modeling - to develop models for estimating the level of information support of the intellectual geospatial economy of coastal regions; analysis of hierarchies - to determine the weights of the factors on the integrated indicator; integrated method - to assess the integrated indicator of the level of information support of the intellectual geospatial economy of coastal regions, taking into account the peculiarities of the use of real estate multi-purpose cadastre; McKean cluster analysis method based on a hierarchical agglomerative structure - to confirm the reliability of the results of the integrated method.

The scientific novelty of the obtained results is: the formation of a conceptual apparatus for determining the intellectual geospatial economy of coastal regions; building a quantitative basis for making informed decisions on the development of information support for the intellectual geospatial economy of coastal regions, taking into account the peculiarities of the use of real estate in the multi-purpose cadastre system; development of scientifically substantiated recommendations for the development of intellectual geospatial economy of coastal regions.

The monograph consists of an introduction, 5 chapters, conclusions and appendices. It can be applied to specialists in the field of regional development, land relations, geospatial support, economic relations, management at the regional level.