

ABOUT THE PUBLICATION OF THE JOINT RUSSIAN-CHINESE MONOGRAPH “SUSTAINABLE DEVELOPMENT AND CYCLIC ECONOMY INFORMATIZATION”¹

In 2009, the state publishing house “Science and Technology of China” published (in Chinese) a joint Chinese-Russian monograph “Sustainable Development and Cyclic Economy Informatization”, which is the one of the first systematic assessments of cyclic economy in the world. The monograph was written by a large group of Chinese scientists and specialists from the Institute of Remote Sensing Methods of the Academy of Sciences of the People’s Republic of China (PRC) and the National Geomatics Research and Engineering Center of PRC, under the direction of the well-known Chinese scientist Professor Cui Wehong. Academician P.Ya. Baklanov was the co-editor of the Russian side. A number of chapters in the book were written by the faculty members of the Pacific Institute of Geography (PIG) of the Far-Eastern Branch of Russian Academy of Sciences (FEB RAS): P.Ya. Baklanov, S.S. Ganzey, and V.V. Ermoshin. This monograph is the result of a long and fruitful cooperation under the Russian-Chinese project for the transboundary areas, 2004–2005, funded by the Russian Foundation for Basic Research and the National Natural Science Foundation of PRC.

The monograph consists of 42 chapters arranged in three main sections.

The first section of the monograph “The Infrastructure of the Regional Spatial Information” begins with a definition of the basic concepts of the regional spatial

information system, the main components of which are remote sensing, GIS, systems of global positioning and georeferencing of geodata, and systems of decision-making support. One of the types of such system, adapted for the goals of sustainable development, according to the authors, are distributed information systems based on the use of the Internet networks (web) as the underlying service and client-server applications. The monograph reviews the modern standards for collection, storage, and processing of metadata (International – ISO/TC 211; within China – NREDIS), which are the basic element content of these systems. The latter were used as an example for the description of the format of the body of elementary metadata in the public information network used in applications for sustainable development.

The authors outlined the available current models and data structures (vector, tessellation, hybrid, etc.) and methods of spatial analysis (overlay, analysis of spatial queries). Theoretical positions of the hierarchical spatial analysis and object-oriented spatial analysis are briefly discussed. A separate chapter is devoted to the structure of the data based on hypergraphs. The concept of geographic (attributive) feature is introduced and the distinction between the traditional and the attribute data models (space, time, qualitative, position, thematic) is discussed.

Considerable attention is given to modern problems of analysis and compilation of searches of the space-time information and to new methods of extracting information

¹ Sustainable development and cyclic economy informatization /ed. Cui Wehong, P.Ya. Baklanov (in Chinese) – Beijing, 2009. – 512 c. ISBN 978-7-5046-5467-0.

from existing heterogeneous databases (data mining)., The monograph provides a summary, as background information, of the basic mathematical approaches and tools for data mining, traditional and developed in the last decades in the world: spatial, statistical, inductive learning, spatial association, cluster, classification, neural networks, decision trees, fuzzy sets, rough sets, cloud computing, pattern recognition, genetic algorithms, data visualization, GIS graphics, and computer geometry.

To solve the problem of comparison of information obtained from different sources and regions, the authors conducted a comparative analysis of modern standards of classification and coding. V.V. Ermoshin, a faculty member of the PIG of FEB RAS reviewed Russian standards and classifications of mapping metadata for digital mapping. The first section culminates with a review of approaches to assessment of the vegetation cover index, terrestrial biomass, and productivity, and of applications used in remote sensing of vegetation, land-use, and water and soil resources.

The second section of the monograph, "Informatization of Regional Sustainable Development", begins with an overview of the main theoretical approaches to the analysis of regional sustainable development. The section provides a detailed review of: applications and approaches to informatization of regional sustainable development; the review covers decision-making support systems for sustainable development, quantitative assessment of resources and land-use analysis, construction of models on optimization of water resources use and their maintenance through integrated management, dynamic modeling of underground water, GIS for modeling of changes in the shoreline, investigation of the sea-water interaction zone and of sea abrasion, forecast of population growth and analysis of the maximal environmental load on arable land, analysis of transportation conditions from the point of view of sustainable development, etc. An example

of analysis of soil erosion in the arid zone of Central Burma for optimization of the agricultural structure is also given.

The section also analyses the systems of indices of sustainable development suggested by the UN (NUCED), sustainable development indices accepted in the US, etc. The results of a model experiment on a comprehensive assessment and analysis of the dynamics of sustainable development in Zhengding County, Hebei Province, are presented. Special attention is given to research on sustainable development and its achievement in the near border and transboundary areas. The Russian colleagues, i.e. P.Ya. Baklanov, S.S. Ganzey, and V.V. Yermoshin, made a substantial contribution to the section. P.Ya. Baklanov presented a method, that he developed, on the assessment of dynamics of the natural resource potential of the territory and his view on the criteria and characteristics of sustainable development. V.V. Yarmoshyn wrote a chapter on the creation of GIS for land-use in the south of the Russian Far-East. The results of land-use zoning of the physiographic boundary region Border-Taypinlin on the Russian-Chinese border are presented (P.Ya. Baklanov, S.S. Ganzey); natural-economic zoning of the border areas are given (P.Ya. Baklanov, S.S. Ganzey, and V.V. Yermoshin). As an example, trends in land-use in the southern part of the Russian Far East and Northeast China (P.Ya. Baklanov, S.S. Ganzey) are analyzed. The chapter ends with a comparative analysis of the main indicators of land-use in the Russian and Chinese parts of the Amur River basin (S.S. Ganzey, V.V. Ermoshin).

The third section of the monograph "Informatization of Cyclic Economy"² is specifically devoted to the aspects of creation of the basis of cyclic economy and to its informational support. The concept of cyclic economy and its main components are

² The term "cyclic economy" assumes the creation of combinations of different interconnected types of activities based on low waste closed technologies and industrial cycles analogues to the natural zero-waste cycles and circulations.

discussed. The section reviews the current state of development of cyclic economy in the world and the key provisions of the law to promote cyclic economy in China (2007). The Chinese authors analyzed the scientific basis for the construction of cyclic economy, including the relevant physical principles, environmental friendliness, system science, regional science, etc. A comparative analysis of the approaches to cyclic economy in China and the developed countries is given. Recycling technologies are the basis of cyclic economy; such technologies include minimization (energy saving and emission reduction), industrial chain, substitution, reuse, resource conservation, zero emissions, and information classification.

A special place in this section is occupied by a discussion of the information component of cyclic economy. It describes the main types of information support of cyclic economy in relation to different scales of facilities: a single enterprise, an industrial park, or a region. Methods of obtaining and processing of data, remote sensing and GIS, and digital environmental models of territories are reviewed. Progressive developments in this area are discussed, particularly, the positive experience of the China-Singapore eco-city in Tianjin; this discussion includes the description of its key components; a system of index assessment developed on the demonstration projects in the eco-city is given. The application of cyclic economy in the new urban area and the system used for environmental monitoring are described. Technical applications for a typical industrial sector are examined. On the example of the crab fisheries, water recycling is assessed. The section reviews a number of

concrete examples of recycling projects in various industries: ferrous and non-ferrous metallurgy, coal industry, power industry, chemical industry, building materials, and consumer good industry. The main key areas of focus are: the use of renewable resources, recycling of metals, and recycling of household waste. The section contains a summary analysis of the basic schemes, structures, and patterns of cyclic economy for different natural and economic conditions, the types of development territories, the experience, technology, etc., in China today.

The current level of theoretical and applied research on the creation of cyclic economy (no-waste industry, sustainable management of multipurpose uses of natural resources and recycled materials) and of its informatization in China, presented in the book, was achieved by the active government support. Already established experimental closed cycles (livestock enterprises, agricultural production) in this country have a high profit margin in contrast to similar projects in the West, which makes such work very attractive worldwide. Despite the fact that the natural resources development in the Russian Far East is still occurring following the extensive pattern, the issues of geoinformation support of multipurpose use of resources, reduction of the impact on the environment, reduction of cost, and increase of profitability are of great interest for our conditions.

The authors of the monograph hope that such models of economic development will be actively implemented in Russia, in China, and in other countries. The joint monograph contributes to this cause.

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