REVIEW

of the opponent of Oriekhova Tetyana Viktorivna

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for the qualification work of Zhong Demin on the topic:

"Benchmarking of the formation of circular clusters",

submitted for the degree of Doctor of Philosophy in the specialty

292 – International Economic Relations

Relevance of the topic of the qualification work. Circular economy, as an economic model with efficient use and recycling of resources as the basis, is gradually becoming an important way to promote the sustainable development of economy and society. Benchmarking, as an effective management tool, provides important support for the establishment and development of circular economy. Therefore, the discussion of benchmarking management formed by circular economy has great practical significance and theoretical value. First of all, from a practical point of view, the formation of circular economy and the implementation of benchmarking management are urgent needs to solve current resource and environmental problems. With the growth of global population and rapid economic development, problems such as resource scarcity and environmental pollution are becoming more and more serious, and the traditional linear economic growth model cannot meet the needs of sustainable development. Thus, Zhong Demin's dissertation "Benchmarking of the formation of circular clusters" is an actual vector for the development of this mainstream idea. This study aims to enhance the theoretical understanding of circular cluster formation and to develop practical suggestions for boosting the development level and quality of circular clusters in China, drawing insights from benchmarking practices.

The dissertation is a component of fundamental scientific research on the topic: "National concept of environmental safety of society and inclusion of the circular economy in the context of a pandemic" (state registration number 0121U109485); fundamental scientific research on the topic: "The Concept of Recovery and Green Reconstruction of Ukraine" (state registration number 0124U000003); implementation

of an international project (Erasmus+ Jean Monnet Module) on the topic: "European Inclusive Circular Economy: Post-War and Post-Pandemic Module for Ukraine" (registration number 101085640); "Geoeconomic and Civilizational Challenges of the Global Economy" (state registration number 0121U111077).

The degree of validity and reliability of scientific provisions, conclusions and recommendations.

The scientific guidelines, conclusions and recommendations set forth in this paper are rooted in the concept of circular economy and facilitate the construction of circular clusters by means of methodological benchmarking tools. The research aims to deepen the understanding of the formation theory of ring cluster and put forward the applied strategy to improve the development level and quality of industrial cluster based on the empirical research results.

The dissertation combines international and national theories of the circular economy and recent advances, combining theory with practice, qualitative with quantitative methods, national and foreign perspectives. The main methods used: the method of theoretical generalization – to substantiate the provisions of the concept of circular economy and the formation of the conceptual apparatus of research; the method of qualitative and quantitative analysis – to identify the essence of the problem through deductive reasoning; methods of analysis and synthesis – to distinguish systems for assessing the circular economy, which allows you to accurately and objectively reflect the development of the region through calculations based on data; monitoring method – to detect changes in cluster analysis; SWOT analysis method – when identifying the strengths and weaknesses of the implementation of the circular economy in the region; methods of data processing, in particular: the method of statistical analysis, the evaluation system with interdependent indicators comprehensively reflects the requirements of the assessment in a hierarchical structure; methods of correlation and regression analysis – to identify dependencies between indicators; cluster analysis – the study uses analyses of the main components and AHP

to assess the level of development of the circular economy; tabular and graphical methods – for visualization of data, main provisions and research results.

Content and structure of the dissertation. The structure of the dissertation is logical. The thesis develops an evaluation system to measure the development of the regional circular economy in the city of Xinyu, based on the considered reference practices for the formation of the circular economy and circular clusters, in order to identify effective strategies and mechanisms to promote the sustainable use of resources and protect the environment.

China's circular economy shows different patterns in environmental protection across regions, depending on economic development and resource use. Interestingly, there are big differences between areas. For example, the western regions tend to have stronger efforts in environmental protection compared to the eastern regions, with the central regions somewhere in the middle. In the east, some places like Beijing, Tianjin, Shanghai, and Fujian do really well in terms of environmental protection, while others like Guangdong, Jiangsu, Shandong, Hebei, and Liaoning don't do as well. In the central region, Anhui, Shanxi, and Henan struggle a bit more with environmental protection, but Jiangxi, Hunan, and Hubei do okay. Out west, Xinjiang, Sichuan, Inner Mongolia, and Shaanxi face challenges in this area, whereas Tibet, Qinghai, Ningxia, Gansu, Chongqing, Yunnan, Guizhou, and Guangxi perform better. (P. 88-103).

The dissertation proposes a framework for assessing regional circular economy development using three normalized dimensions: economic, resource, and environmental, scaled from 0 (minimum) to 1 (maximum). This framework creates a cubic model in the first quadrant, divided into eight octants. Each region's development index is represented by a spatial point, showing its status at a specific time. Over time, these points move from the first to the eighth octant, illustrating a decade-long developmental trajectory. Typically, this path trends upwards but can vary based on regional priorities. Analyzing these pathways helps identify challenges, highlight best practices, and inform future decision-making. The journey from the origin O to the apex A of the eighth octant reflects progress, with each point's coordinates representing economic, environmental, and social viability indicators. (P. 106-110).

The establishment of an environmental assessment system is a critical step for transforming Xinyu High-tech Zone. By setting clear goals, developing indicators, creating mechanisms, and enhancing government support, this system will accelerate the zone's and major enterprises' transition to green, low-carbon, and circular economies. This will also promote a balance between economic growth and environmental sustainability. (P. 113-130).

From a benchmarking perspective, this dissertation examines global circular economy practices from countries like the EU, Germany, France, Japan, and the US. It compares these practices with China's initiatives to explore the current state and challenges of China's circular economy. Based on this analysis, the dissertation proposes recommendations to address these issues. (P. 174-175).

Scientific novelty of the results of the dissertation work

First obtained :

- a methodological approach was developed, reflected through a system of indicators for assessing the development of the regional circular economy for its classification by characteristics in the provinces of China, on the basis of which the spatial distribution of the circular economy was carried out and regions were classified accordingly by the use of China's resources;
- a system of indices for assessing the regional development of circular economy clusters was proposed based on current legislation, regional experience and 35 indicators in three dimensions of "economy-resource-environment" (indices of economic production (C1), industrial structure (C2), resource consumption (C3), use (C4), waste disposal (C5) and pollution control (C6), as well as their development paths). On the basis of which, a model for the development of the regional circular economy was developed and an analysis of the evolution of the development path of circular economy clusters was carried out;

Improved:

- the conceptual justification and theoretical positioning of industrial clusters in the circular economy system in the projection of the world benchmarking of the formation of circular clusters;

- the system of interaction between enterprises, industrial parks and the government at the micro-level of regional circular economy development and the method of measuring the degree of development of industrial clusters;
- the system of evaluation of the circular economy of Xinyu High-tech Zone has been improved based on benchmarking and three-dimensional characteristics of the circular economy and resource consumption indicators (B3) and (B4), on the basis of which a matrix of evaluation of resource use indicators;

Further developed

- the ecological evaluation mechanism of the transformation of Xinyu High-tech Zone towards the rapid development of green, low-tech zones, carbon circular economy, and the achievement of coordinated development of economy and environment;
- the proposal of circular economy development in Xinyu High-tech Zone for planning the industrial chain of the new steel industry of circular economy and the industrial chain scheme of the coal and chemical industry of circular economy based on the correlation index between Xinyu High-tech Industrial Park and domestic and foreign industrial parks;
- the conceptualization of key problems of the implementation and functioning of circular clusters, in particular in the Xinyu High-tech Zone, has been further developed, including the challenges faced by enterprises, parks and the government during the planning and development of the regional circular economy.

This dissertation broadens the theoretical framework for studying the regional circular economy by examining its structure, functionalities, objectives, distinctive features, and evaluation methodologies. It directs attention towards the operational mechanisms and models of the regional circular economy within the broader context of regional development. The dissertation posits that the circular economy signifies a novel paradigm of sustainable development, marking a fundamental shift in technological and economic approaches. By scrutinizing the merits and demerits of existing evaluation index systems from institutions such as the National Development

and Reform Commission, the State Administration of Environmental Protection, and the National Bureau of Statistics (at the macro level), as well as insights from relevant scholars, the dissertation enhances the system of indices for assessing the regional circular economy. A performance evaluation system emphasizing the economy, resources, and environment has been devised, which identifies nine crucial components through an analysis of its main constituents.

The dissertation introduces an innovative approach for evaluating the progress of the regional circular economy, employing a set of primary indices to underscore key elements and bolster scientific rigor through the application of Analytic Hierarchy Process (AHP) assessment. This methodology offers a comprehensive examination of the economy, resources, efficiency, and diverse facets of the regional circular economy's development, leveraging the hierarchical analysis capabilities of AHP.

By assessing the circular economy across 31 provinces, municipalities, and autonomous regions in China, the study presents scientific suggestions aimed at bolstering regional circular economy development. The dissertation sheds light on the current landscape of the circular economy in these provinces, assisting governments, businesses, and the public in gaining a clearer understanding of regional circular economic progress and offering strategies for enhancement.

Completeness of reflection of the main provisions of the dissertation in the works published by the author. The main provisions of the dissertation were published in 7 scientific papers, including 1 paper in the publication included in the international scient metric database Scopus, 4 papers in scientific professional journals of Ukraine, 2 papers in other publications based on the materials of conferences. The results of the applicant's research were reported and discussed at international scientific and practical conferences.

A dissertation constitutes an individual scientific endeavor, where all presented findings are the author's sole accomplishments. Regarding co-authored scientific works, only those concepts and provisions stemming from the applicant's autonomous research efforts were incorporated into the dissertation.

Assessment of dissertation structure, language and style of presentation. The dissertation consists of an introduction, three chapters, a conclusion and a list of references.

The dissertation employs business English with a scientific tone to convey its content, distinguished by its comprehensiveness, semantic thoroughness, logical progression of topics addressed, precise utilization of specialized terminology, and a clear, concise, and unbiased presentation of research findings.

Absence (presence) of violation of academic integrity. The scientific results of the dissertation were obtained by the author personally. The ideas and provisions from the scientific papers published in co-authorship, were obtained by the author personally and were used in the dissertation.

No violations of academic integrity were found in Zhong Demin's dissertation. The dissertation contains references to relevant sources of information, provides reliable information on the methods used and the results of the research conducted, and complies with copyright and related rights legislation. All this allows us to conclude that the author of the dissertation adhered to the requirements and rules of academic integrity.

Remarks on the work and its debatable provisions

The following should be attributed to the shortcomings and remarks of a debatable nature:

1. The author's position that when constructing a system of indices for evaluating circular industrial clusters, both international standards and the characteristics and differences of different regions of China can be considered simultaneously requires additional arguments. (P. 80-89)

2. The thesis states that the development of circular industry clusters requires joint efforts of the government, enterprises and the public. The author's position on assessing the specific role and synergy of these three parties in promoting the formation and development of circular industrial clusters requires explanation. (P. 169-170)

3. The thesis analyzes in detail the development of circular industrial clusters in the Xinyu High-Tech Zone. However, different regions may have different industrial

bases and resources. The author's position on the possibility of reproducing and popularizing the experience of the Xinyu High-Tech Zone in other regions requires additional explanations. (P. 182-187)

4. The thesis emphasizes the importance of technological innovation in the development of circular industrial clusters. However, the author should have paid special attention to measuring the degree of technological innovation and its actual contribution to the development of circular industrial clusters. However, the formulas given on pp. 173-174 do not contain an explanation of the value of the S indicator.

5. The thesis does not pay enough attention to the study of the impact of globalization and digitalization on the development of circular industrial clusters (pp. 174-175).

The remarks mentioned and discussion points indicate some controversial aspects of the research. However, overall, they highlight the relevance, complexity, and multifaceted nature of the chosen topic, its practical significance, and do not significantly affect the qualitative characteristics of the qualification thesis.

General conclusion and assessment of the qualification work.

The qualification thesis of Zhong Demin's on the topic "Benchmarking of formation of circular clusters" is an independent qualification scientific work that is performed on a topical topic and solves an urgent scientific problem.

In terms of content and professional orientation, the qualification thesis meets the specialty 292 "International Economic Relations" of the field of knowledge 29 "International Relations". It also meets the quality and level of theoretical and practical developments expected of a qualification thesis for obtaining a PhD degree, offering a unique authorial approach to solving the scientific task.

Overall, the qualification thesis "Benchmarking of formation of circular clusters" meets the requirements of the Resolution of the Cabinet of Ministers of Ukraine dated January 12, 2022, No. 44 "On the Approval of the Procedure for Awarding the Degree of Doctor of Philosophy and the Cancellation of the Decision of a One-time Specialized Academic Council of a Higher Education Institution, Research Institution on Awarding the Degree of Doctor of Philosophy" in terms of content,

substantiation of scientific provisions and recommendations, and level of scientific novelty. The author, Zhong Demin, deserves to be awarded the degree of Doctor of Philosophy in the specialty 292 "International Economic Relations".

Official opponent:

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