REVIEW
of the official reviewer for the thesis of
Amangeldiyeva Birganym Askarkyzy on the theme «State regulation of the circular economy's development in the Republic of Kazakhstan», presented for the degree of Doctor of Philosophy (PhD) in the educational program «8D04103 – State and local government».

№	Criteria	Eligibility	Justification of the official reviewer's position
1.	The topic of the thesis (as of the date of its approval) corresponds to the directions of development of science and/or state programs	1.1 Compliance with priority areas of science development or government programs: **1) The thesis was completed within the framework of a project or target program financed from the state budget (indicate the name and number of the project or program)** 2) The thesis was completed within the framework of another state program (indicate the name of the program) 3) The thesis corresponds to the priority direction of the development of science, approved by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan (indicate the direction)	The dissertation work is consistent with the government's strategic frameworks on sustainable development, the green economy, and environmental governance. It engages directly with the Sustainable Development Goals (SDGs) and embeds circular economy principles within national policy instruments, thereby advancing Kazakhstan's transition to resource-efficient and low-carbon growth. This alignment is evident in several key documents, including the Decree of the Government of the Republic of Kazakhstan No. 883 "Concept for Transition to a Green Economy" (2013), the Presidential Addresses of the President of the Republic of Kazakhstan K. J. Tokayev (2021–2024), and the Decree of the Government of the Republic of Kazakhstan No. 910 "On the Approval of the Concept for the Development of Environmental Culture 'Taza Kazakhstan' for 2024–2029." The thesis was completed within the framework of a project, financed from the state budget: 1. "AP09259851 – Development of a circular economy in Kazakhstan: potential, trends, prospects (2021–2023)" 2. "AP19576593 – Responsible production in Kazakhstani enterprises as a tool for achieving SDG 12: assessment of potential and development prospects (2023–2025)".
2.	Importance for science	The work **makes**/does not make a significant contribution to science, and its importance is **well disclosed**/not disclosed.	The dissertation makes a significant contribution to the scientific literature on environmental economics and public policy by resolving key conceptual ambiguities in the circular economy paradigm and advancing methodological rigor through a bespoke multi-level framework that links macro, meso, and micro regulatory instruments. It further introduces novel empirical tools to uncover the determinants of circular behaviour and pinpoint systemic barriers in Kazakhstan's agro-industrial complex. Finally, its importance is well-disclosed via evidence-based

			recommendations that directly inform national and sectoral governance strategies, thereby bridging the divide between academic research and practical policy implementation.
3.	The principle of independence	Self-reliance level: **1) High;** 2) Medium; 3) Low; 4) No independence	The candidate Amangeldiyeva B.A. has shown a high level of self-reliance throughout the research process by independently developing the conceptual framework, designing and implementing a customized multi-level methodology, and conducting primary data collection through surveys and expert interviews. The dissertation showcases original data analysis using various quantitative and qualitative methods.
4.	The principle of inner unity	4.1 Justification of the relevance of the thesis: **1) Justified;** 2) Partially justified; 3) Not justified.	The relevance of this dissertation is fully justified by highlighting the need for Kazakhstan to transition from a linear to a circular economic model in response to mounting resource scarcity, environmental degradation, and international sustainability commitments. The study addresses a clear policy gap in the national regulatory framework - namely, the absence of an integrated, multi-level approach to circular-economy governance - and offers empirical evidence directly applicable to ongoing initiatives. Moreover, it contributes original insights into the agro-industrial sector, which is critical to the country's economic resilience, thereby aligning scholarly research with both national strategic priorities and the United Nations Sustainable Development Goals.
		4.2 The content of the thesis reflects the topic of the thesis: **1) Reflects;** 2) Partially reflects; 3) Does not reflect	The content of the thesis reflects the topic of the thesis. All chapters and sections of the dissertation are consistently devoted to the declared theme of "State regulation of the circular economy's development in the Republic of Kazakhstan." The literature review systematically surveys circular-economy theory and policy frameworks; the methodology is tailored to assess regulatory instruments at macro, meso and micro levels; the empirical results directly address the determinants and barriers of circular practices in Kazakhstan's agro-industrial sector; and the conclusions and recommendations map back onto the state's strategic priorities for a green economy, carbon neutrality and digital transformation. This coherence between title, objectives, methods, and findings demonstrates that the content fully reflects the stated topic.

		4.3. The purpose and objectives correspond to the topic of the thesis: 1) **correspond;** 2) partially correspond; 3) do not correspond	The purpose and objectives correspond to the topic of the thesis. The purpose of the dissertation - a comprehensive analysis of the processes of formation of the circular economy in the Republic of Kazakhstan and the development of substantiated recommendations for strengthening state regulatory mechanisms - is consistent with the stated topic of the study. Eight formulated tasks, covering a review of theoretical and methodological approaches, analysis of international experience, assessment of the current state at the macro- and meso-levels, empirical study of the industry context, and development of recommendations, logically follow from this goal and provide a comprehensive and systematic disclosure of the stated problem.
		4.4 All sections and provisions of the thesis are logically interconnected: 1) **completely interconnected;** 2) the interconnection is partial; 3) there is no interconnection	All sections and provisions of the thesis are logically and completely interconnected. The structure of the dissertation from the introduction to the conclusion consistently reveals the stated topic: the introduction substantiates the relevance, purpose and objectives of the study, the theoretical section creates a methodological base; on its basis, the following chapters assess the state of the circular economy in Kazakhstan and perform an empirical analysis; the final section formulates specific recommendations and management measures based on the results obtained. Such a step-by-step and coordinated organization of the material confirms the complete logical interconnection of all its sections and provisions.
		4.5 The new solutions (principles, methods) proposed by the author are reasoned and evaluated in comparison with the known solutions: 1) **there is a critical analysis;** 2) partial analysis; 3) the analysis does not represent one's own opinions, but quotes from other authors	There is a critical analysis. The dissertation demonstrates a strong critical approach by systematically analyzing existing state regulation models for the circular economy. Rather than simply cataloguing prior approaches, the author actively contrasts each proposed regulatory mechanism, economic incentive, and digital oversight tool against prevailing scholarly positions. This evaluative exercise illuminates conceptual and practical gaps at the macro, meso, and micro levels. It substantiates the tailored recommendations for Kazakhstan by demonstrating why selected solutions outperform existing alternatives in feasibility, scalability, and alignment with national strategic goals.
5.	Scientific novelty principle	5.1 Are the scientific results and provisions new? 1) completely new; 2) **partially new (25-75% are**	Scientific results and provisions are partially new. The dissertation combines well-established conceptual and methodological elements—notably the 3R-9R framework and standard industrial ecology principles—with substantially original contributions. Approximately one-third of the content comprises novel regulatory

		new); 3) not new (less than 25% are new)	constructs, including the bespoke multi-level governance framework that integrates macro, meso, and micro instruments; new empirical findings on the drivers and barriers of circular practices in Kazakhstan's agro-industrial complex; and innovative adaptation of digital monitoring and eco-industrial park tools to the national context. These fresh insights and tailored policy proposals are rigorously derived from primary data and critically evaluated against existing models. At the same time, the remainder of the work appropriately contextualizes these advances within the broader body of scholarship.
		5.2 Are the thesis findings new? 1) completely new; 2) **partially new (25-75% are new);** 3) not new (less than 25% are new)	The thesis findings are partially new. The dissertation combines proven conceptual foundations with significant new results. About a third of the main provisions represent original scientific findings: the adaptation of international circular economy models and ESG concepts to the realities of Kazakhstan; the systematization of institutional barriers at the macro-, meso- and micro-levels, performed for the first time in the domestic literature; the development of a model for integrating digital monitoring mechanisms into public policy; and the presentation of unique empirical data on the determinants of the "circular" behavior. Practical recommendations for the creation of EIP and the implementation of digital and AI solutions confirm the applied value of the work. The rest of the conclusions reasonably generalize existing approaches, which confirms the partial, but significant novelty of the dissertation.
		5.3 Technical, technological, economic or management decisions are new and reasonable: 1) completely new; 2) **partially new (25-75% are new);** 3) not new (less than 25% are new)	The dissertation contains partially new (25-75% are new) solutions with proven validity and relevance for Kazakhstan: a model of EIP of the agro-industrial complex with an organized exchange of by-products; the architecture of digital and AI systems for real time monitoring, predictive analysis and automatic regulation of raw material and product flows; as well as a digital platform (QazaqCircular Hub) for transparent accounting of secondary resources and analytics, forming the basis for sound management decisions. All of the listed technical, economic and managerial innovations are adequately linked to the current regulatory framework, infrastructural and socio-economic features of the country, which confirms their practical applicability.

6.	The validity of the main findings	All main conclusions **are**/are not **based** on scientifically significant evidence	All the main conclusions of the work are based on reliable scientific data and methodologically verified within the framework of the selected research design. The use of a balanced combination of quantitative methods of statistical processing of surveys and structural modeling with the involvement of qualitative expert interviews, and analysis of regulatory documents and reports ensures comprehensive verification of the results. Such a comprehensive approach allows for reasonable confirmation of each key statement and meets the high standards of scientific research.
7.	The main provisions for the defense	It is necessary to answer the following questions for each provision separately: 7.1 Is the provision proven? 1) proven; 2) rather proven; 3) rather not proven; 4) not proven 7.2 Is it trivial? 1) yes; 2) no 7.3 Is it new? 1) yes; 2) no 7.4 Application level: 1) narrow; 2) medium; 3) wide 7.5 Is it proven in the article? 1) yes; 2) no	1) A multi-level methodology for assessing the development of a circular economy in the Republic of Kazakhstan has been developed, including a system of indicators at the macro, meso, and micro levels, reflecting institutional, economic, and behavioral aspects. 7.1 Is the provision proven? 1) proven; 7.2 Is it trivial? 2) no; 7.3 Is it new? 1) yes; 7.4 Application level: 2) medium; 7.5 Is it proven in the article? 1) not fully. 2) It has been established that an increase in costs does not have a statistically significant effect on the level of recycling and reuse of waste, as confirmed by regression analysis, highlighting the importance of intangible factors. 7.1 Proven? 1) proven; 7.2 Trivial? 2) no; 7.3 New? 1) yes; 7.4 Application level? 2) medium;

			7.5 Proven in article? 1) yes; Zhidebekkyzy, A., Temerbulatova, Z., Amangeldiyeva, B. A., & Sakhariyeva, A. (2023). Towards a Circular Economy: an Analysis of Kazakhstani case. Journal of Economic Research & Business Administration, (1)143, 16–32. https://doi.org/10.26577/be.2023.v143.i1.02 3) A comprehensive analysis of population and expert surveys allowed for the identification of key determinants of circular behavior and stakeholder readiness. 7.1 Proven? 1) proven; 7.2 Trivial? 2) no; 7.3 New? 1) yes; 7.4 Application level? 2) medium; 7.5 Proven in article? 1) yes; Zhidebekkyzy, A., Moldabekova, A., Amangeldiyeva, B., & Streimikis, J. (2022). Assessment of factors influencing pro-circular behavior of a population. Economics & Sociology, 15(3), Article 12. https://doi.org/10.14254/2071-789X.2022/15-3/12 Zhidebekkyzy, A., Moldabekova, A., Amangeldiyeva, B., & Šanova, P. (2023). Transition to a circular economy: Exploring stakeholder perspectives in Kazakhstan. Journal of International Studies, 16(3), 144–158. https://doi.org/10.14254/2071-8330.2023/16-3/8 4) Based on semi-structured expert interviews with agro-industrial representatives, industry-specific barriers to CE were identified. 7.1 Proven? 1) proven; 7.2 Trivial? 2) no; 7.3 New?

			1) yes; 7.4 Application level? 2) medium; 7.5 Proven in article? 1) not fully. 5) Practical recommendations were developed to stimulate the circular economy at macro and meso levels, including the introduction of eco-industrial parks for the agro-industrial complex. 7.1 Proven? 1) proven; 7.2 Trivial? 2) no; 7.3 New? 1) yes; 7.4 Application level? 2) medium; 7.5 Proven in article? 1) yes; Zhidebekkyzy, A., Moldabekova, A., & Amangeldiyeva, B. (2023). Pro-environmental behavior and household waste sorting in Kazakhstan: An empirical analysis. Eurasian Journal of Economic and Business Studies, 67(1), 39–51. https://doi.org/10.47703/ejebs.v1i67.186 Zhidebekkyzy, A., Moldabekova, A., Amangeldiyeva, B., & Streimikis, J. (2022). Assessment of factors influencing pro-circular behavior of a population. Economics & Sociology, 15(3), Article 12. https://doi.org/10.14254/2071-789X.2022/15-3/12 Zhidebekkyzy, A., Moldabekova, A., Amangeldiyeva, B., & Šanova, P. (2023). Transition to a circular economy: Exploring stakeholder perspectives in Kazakhstan. Journal of International Studies, 16(3), 144–158. https://doi.org/10.14254/2071-8330.2023/16-3/8 Zhidebekkyzy, A., Kalmakova, D., & Amangeldiyeva, B. (2022). Implementation of circular economy principles across countries. Central Asian Economic Review, 6, 43–62. https://doi.org/10.52821/2789-4401-2021-6-43-62

8.	The principle of reliability Reliability of sources and information provided	8.1 Choice of methodology is justified or the methodology is described in sufficient detail 1) **yes;** 2) no	The choice of methodology is justified. The dissertation substantiates the chosen methodological approach in the first chapter, namely in 1.4: the stages of the mixed research are described in detail - from the analysis of regulatory documents and programs at the macro level, the formation of a representative sample for an expert survey and expert interview at the meso level, and the development of a questionnaire for a quantitative survey of the population at the micro level. Each methodological tool is accompanied by an argumentation of its relevance in the context of the dissertation objectives, and the data processing procedure (statistical analysis in SPSS, construction of PLS models, interview analysis) is described with a sufficient degree of detail for reproducibility. The "macro-meso-micro" approach is motivated by the need for a multi-level assessment of regulatory mechanisms and is supported by theoretical references to the best international practices, which confirms the logic and completeness of the methodological justification.
		8.2 The results of the thesis were obtained using modern methods of scientific research and methods of processing and interpreting data using computer technologies: **1) yes;** 2) no	The results of the thesis were obtained using modern methods of scientific research and methods of processing and interpreting data using computer technologies. The "mixed" design used in the work combines quantitative and qualitative approaches implemented using computer technologies: statistical processing of large arrays of field surveys in SPSS with reliability and significance testing, construction of PLS-SEM models in SmartPLS to identify structural relationships, as well as qualitative analysis of interviews with experts using specialized programs. In addition, the author developed a digital platform for monitoring "circular" resource flows and used predictive analytics methods based on AI and IoT, which confirms the use of modern tools for collecting, processing, and interpreting data.
		8.3 Theoretical conclusions, models, identified relationships and patterns have been proven and confirmed by experimental research (for areas of training in pedagogical sciences, the results have been proven on the basis of a pedagogical experiment): 1) **yes;** 2) no	Theoretical conclusions, models, identified relationships, and patterns have been proven and confirmed by experimental research. The theoretical propositions and conceptual frameworks have been validated through a comprehensive empirical strategy. Quantitative data were analysed using advanced statistical and structural-equation-modeling techniques, yielding strong model fit and statistically significant paths. At the same time, qualitative insights from expert interviews provided convergent confirmation of the identified relationships and patterns. This integrated validation approach firmly substantiates the dissertation's theoretical conclusions.

		8.4 **Important statements are confirmed** / partially confirmed / not confirmed **by references to current and reliable scientific literature**	Important statements are confirmed by references to current and reliable scientific literature. The dissertation consistently anchors its key assertions in up-to-date, peer-reviewed, and policy-relevant sources. For example, the fundamental definition and principles of the circular economy are drawn directly from the Ellen MacArthur Foundation and the European Commission's Circular Economy Action Plan; methodological choices cite seminal studies in the Journal of Cleaner Production, including Geissdoerfer et al. (2017), Kirchherr et al. (2017) and others; and policy recommendations are contextualized with OECD toolkits and recent national legislation. This thorough citation approach ensures that all key arguments are supported by up-to-date and reputable sources.
		8.5 **Used literature sources are sufficient**/not sufficient for a literature review	The literature sources used are sufficient for a literature review. The dissertation uses 145 different sources, which provide a wide coverage of both classical theoretical works and current empirical studies and legislative documents. This number of references confirms the completeness and depth of the literature review, allowing for a comprehensive consideration of circular economy concepts, methodological approaches, and international, regional, and national contexts.
9	Practical value principle	9.1 The thesis has theoretical value: 1) **yes;** 2) no	The thesis has theoretical value. The dissertation makes a significant theoretical contribution by integrating and expanding upon existing models of the circular economy with governance theory. This results in a new multi-level regulatory framework that connects analyses at the macro, meso, and micro scales. By adapting international circular economy and ESG concepts to the context of Kazakhstan, the work sharpens theoretical insights regarding institutional barriers and policy instruments. Additionally, it enhances our understanding of how digital monitoring mechanisms can be conceptualized within public policy theory. This combination of conceptual innovation and contextual adaptation enriches the academic discussion on state regulation of circular economies and provides a solid foundation for further theoretical development.
		9.2 The thesis is of practical importance and there is a high probability of applying the results obtained in practice: 1) **yes;**	The thesis holds significant practical value, with results applicable in policymaking, public sector planning, and sectoral development, particularly in the agro-industrial sector. The thesis is of practical importance and there is a high probability of applying the results obtained in practice. The practical significance of the work is confirmed by

		2) no	the developed recommendations for the creation of EIP, a roadmap for the transition to the CE, the introduction of technologies such as AI and IoT in AIC, digital platforms for monitoring resource flows that correspond to national programs for achieving sustainable development and developing a green economy. Moreover, the practical application is confirmed by two acts of implementing the dissertation results: JSC "Almaty City Development Center" and LLP "Zhanassyl".
		9.3 Are the practice suggestions new? 1) completely new; 2) **partially new (25-75% are new);** 3) not new (less than 25% are new)	Practice suggestions are partially new. The practical recommendations of the dissertation are a combination of already known international instruments (extended producer responsibility mechanisms, eco-industrial parks) and significantly new proposals adapted to the Kazakhstani context: integration of IoT and AI monitoring into the state supervision system, development of a digital platform for accounting and predictive analytics of secondary resources, as well as the introduction of dynamic economic incentives in real time.
10.	The quality of writing and design	Academic writing quality: **1) high;** 2) average; 3) below average; 4) low.	The dissertation exhibits exemplary academic writing, characterised by a clear and logical structure, precise and consistent use of technical terminology, and an appropriately formal register throughout. Each chapter opens with concise introductions and closes with summarising transitions, ensuring seamless coherence. Arguments are developed in well-constructed paragraphs, supported by accurate and properly formatted citations. The methodology and findings are described with sufficient detail and clarity to allow full reproducibility, while discussions demonstrate sophisticated synthesis of theory and evidence.
11.	Notes on a thesis		In the section describing the methodology, it would be better to briefly mention the study's main limitations (e.g., possible self-selection of experts, seasonality of agricultural indicators) – this will add transparency. Also, there are long sentences (3-4 subordinate clauses) in some places. It is recommended to break them into shorter ones to improve readability and maintain an academic style. All recommendations aim to clarify and improve without undermining the study's scientific significance or practical value.

12.	Scientific level of the doctoral student's articles on the topic of research (in case of defense of the thesis in the form of a series of articles, the official reviewers comment on the scientific level of each article of the doctoral student on the topic of research)		The doctoral student has published 12 works, including 2 articles in Scopus-indexed journals, 5 in journals recommended by the Ministry of Science and Higher Education of Kazakhstan, 1 participation in the collective monograph, and 4 papers in materials of international conferences. All publications are peer-reviewed and methodologically sound, reflecting original findings and a substantial scientific contribution. Each of them is closely aligned with the topic of circular economy and addresses different aspects of the dissertation research.
13.	Decision of the official reviewer (pursuant to paragraph 28 of the present Model Regulations)		Amangeldiyeva B.A.'s dissertation is an original and independent study that meets all the requirements of the educational program "8D04103 – State and Local Government." The author is recommended for the awarding of a PhD degree.

Amangeldiyeva Birganym Askarkyzy's thesis, titled "State regulation of the circular economy's development in the Republic of Kazakhstan", has been completed and is recommended for the award of the Doctor of Philosophy (PhD) degree in the educational program "8D04103 – State and local government".

Reviewer:
PhD, Associate Professor
Faculty of Economics and Entrepreneurship
Kazakh-German University (Almaty, Kazakhstan) Tleppayev A.M.

Подпись верна. Падалко менеджер по работе с персоналом

Республика Казахстан город Алматы «Алматыдағы қазақ-неміс университеті» мекемесінің Казахстанско-Немецкий университет в Алматы