

Written Review by the Official Reviewer

on the dissertation work of doctoral candidate Saya Meirkhanovna Sakenova

on the topic: **“Specific Features of the Development of Bioclimatic Architecture for Low-Rise Urban Housing in Southeastern Kazakhstan”**, submitted for the degree of Doctor of Philosophy (PhD)

in the educational program 8D07311 - “Architecture”

No.	Criteria	Compliance with the criteria (the selected option is indicated in the text)	Justification of the official reviewer’s position
1.	The dissertation topic, as of the date of its approval, corresponds to areas of scientific development and/or state programs	1.1 Compliance with priority areas of scientific development or state programs: <ol style="list-style-type: none"> 1) The dissertation was carried out within the framework of a project or targeted program funded from the state budget; 2) The dissertation was carried out within the framework of another state program; 3) <u>The dissertation corresponds to a priority area of scientific development approved by the Supreme Scientific and Technical Commission under the Government of the Republic of Kazakhstan.</u> 	The dissertation work corresponds to the priority area of scientific development “Intellectual Potential of the Country” and to the specialized scientific field “Architecture and Construction.” The research topic is related to current issues of sustainable urban development, improvement of housing energy efficiency, adaptation of architectural solutions to natural and climatic conditions, and formation of a comfortable residential environment in the conditions of Southeastern Kazakhstan.
2.	Importance for science	The work makes/does not make a significant contribution to science, and its importance is/is not well disclosed.	The work makes a significant contribution to the development of architectural science in terms of the theoretical interpretation of bioclimatic architecture for low-rise urban housing. The significance of the study lies in the transition from an averaged climatic approach to the analysis of the microclimatic heterogeneity of the urban environment. The author demonstrates that, for Almaty, Konaev, and Taldykorgan, design solutions should not be formed

			according to a single regional scheme, but should take into account differences in topography, insolation, wind regime, building density, landscaping, and the morphology of the residential environment.
3.	Principle of independence	Level of independence: 1) high; 2) medium; 3) low; 4) no independence.	The dissertation demonstrates a high level of independent scientific work. The author independently developed the research logic, analyzed domestic and international experience, and systematized natural and climatic, territorial and landscape, urban planning, and architectural and planning factors. The applicant's personal contribution is reflected in the development of the microclimatic differentiation approach, the classification of siting conditions for low-rise housing, and the formulation of differentiated architectural recommendations.
4.	Principle of internal coherence	4.1 Justification of the relevance of the dissertation: 1) substantiated; 2) partially substantiated; 3) not substantiated.	The relevance of the dissertation is convincingly substantiated. The contemporary development of low-rise urban housing in Kazakhstan requires consideration of climatic risks, seasonal temperature contrasts, summer overheating, wind impacts, insufficient aeration of certain areas, and the need to apply passive architectural techniques. In this context, addressing bioclimatic architecture and microclimatic differentiation is timely and scientifically significant.
4.	Principle of internal coherence	4.2 The content of the dissertation reflects the dissertation topic: 1) reflects; 2) partially reflects; 3) does not reflect.	The content of the dissertation fully reflects the stated topic. The structure of the work consistently reveals the theoretical foundations of bioclimatic architecture, the factors shaping low-rise urban housing in regional conditions, the methodology of microclimatic differentiation, and the system of architectural and planning recommendations for the studied cities.
4.	Principle of internal coherence	4.3 The aim and objectives correspond to the dissertation topic: 1) correspond; 2) partially correspond; 3) do not correspond.	The aim of the research and the stated objectives correspond to the dissertation topic. They are directed toward identifying the specific features of the development of bioclimatic architecture for low-rise urban housing, analyzing natural and climatic and urban planning factors, determining microclimatic differences, and developing differentiated design recommendations. Such a formulation of the objectives logically reveals the stated scientific problem.
4.	Principle of internal coherence	4.4 All sections and provisions of the dissertation are logically interconnected: 1) fully interconnected; 2) partially interconnected; 3) no interconnection.	All sections of the dissertation are logically interconnected. The theoretical provisions of the first section form the basis for the analysis of factors and regional experience in the second section. The results obtained then lead to the methodology of microclimatic differentiation and the author's model of differentiated design. The conclusions of the sections are consistent with the overall aim of the research.
4.	Principle of internal coherence	4.5 The new solutions proposed by	The solutions proposed by the author are substantiated and correlated with

	coherence	<p>the author (principles, methods) are substantiated and evaluated in comparison with known solutions:</p> <ol style="list-style-type: none"> 1) <u>critical analysis is present;</u> 2) the analysis is partial; 3) the analysis consists not of the author's own views but of quotations from other authors. 	<p>existing approaches to bioclimatic design. The work critically examines international and domestic practices, methodological guidelines for bioclimatic analysis, and the limitations of universal climatic recommendations. On this basis, the need for microclimatic differentiation and the development of zone-oriented architectural solutions is justified.</p>
5.	Principle of scientific novelty	<p>5.1 Are the results and provisions new?</p> <ol style="list-style-type: none"> 1) <u>completely new;</u> 2) partially new (25-75% are new); 3) not new. 	<p>The scientific novelty of the research is manifested in the systematization of the factors shaping bioclimatic architecture for low-rise urban housing as applied to Southeastern Kazakhstan, in identifying microclimatic differentiation as a methodological basis for design, and in developing the author's model for the transition from site-condition analysis to differentiated architectural solutions. At the same time, the work develops existing provisions of bioclimatic architecture and adapts them to the regional context.</p>
5.	Principle of scientific novelty	<p>5.2 Are the conclusions of the dissertation new?</p> <ol style="list-style-type: none"> 1) <u>completely new;</u> 2) partially new (25-75% are new); 3) not new. 	<p>The conclusions of the dissertation possess scientific novelty in substantiating the dependence of architectural solutions for low-rise housing on local microclimatic conditions. New results include conclusions concerning different design logic for zones of wind exposure, moderately protected areas, zones with restricted aeration, and areas determined by topography and landscape structure.</p>
5.	Principle of scientific novelty	<p>5.3 Are the technical, technological, economic, or management solutions new and substantiated?</p> <ol style="list-style-type: none"> 1) <u>completely new;</u> 2) partially new (25-75% are new); 3) not new. 	<p>The proposed solutions are new and substantiated in architectural and planning and methodological aspects. The author proposes a system of techniques that includes volumetric-planning, spatial, structural, enclosure-related, insolation, aeration, and microclimatic solutions. Their novelty lies not in the isolated application of individual techniques, but in linking them to the type of microclimatic situation and to the regional conditions of the three studied cities.</p>
6.	Substantiation of the main conclusions	<p>All main conclusions are/are not based on scientifically significant evidence and are sufficiently well substantiated.</p>	<p>The main conclusions of the dissertation are based on theoretical analysis, comparative study of international and domestic experience, graphic-analytical interpretation of climatic, cartographic, landscape, and urban planning data, as well as typological analysis of low-rise residential development. For research in the field of architecture, this set of methods is sufficient and ensures that the conclusions are well reasoned.</p>
7.	Main provisions	<p>The following questions must be</p>	<p>Provision 1. Bioclimatic architecture for low-rise urban housing in</p>

<p>submitted for defense</p>	<p>answered separately for each provision:</p> <p>Provision 1.</p> <p>7.1 Has the provision been proven? 1) <u>proven;</u> 2) rather proven; 3) rather not proven; 4) not proven</p> <p>7.2 Is it trivial? 1) yes; 2) no.</p> <p>7.3 Is it new? 1) yes; 2) no.</p> <p>7.4 Level of application: 1) narrow; 2) medium; 3) <u>wide.</u></p> <p>7.5 Has it been proven in an article? 1) yes; 2) no.</p> <p>Provision 2.</p> <p>7.1 Has the provision been proven? 1) <u>proven;</u> 2) rather proven; 3) rather not proven; 4) not proven</p> <p>7.2 Is it trivial? 1) yes; 2) no.</p> <p>7.3 Is it new? 1) yes; 2) no.</p> <p>7.4 Level of application: 1) narrow; 2) medium; 3) <u>wide.</u></p> <p>7.5 Has it been proven in an article? 1) yes; 2) no.</p> <p>Provision 3.</p>	<p>Southeastern Kazakhstan should be formed on the basis of the microclimatic heterogeneity of the urban environment.</p> <p>Provision 2. Microclimatic differentiation includes natural and climatic, territorial and landscape, urban planning, and architectural and planning factors.</p> <p>Provision 3. Differentiated architectural solutions and the author's model ensure the transition from site analysis to integrated zone-oriented design synthesis.</p> <p>The provisions submitted for defense are logically substantiated. The first provision is confirmed by the analysis of differences between Almaty, Konaev, and Taldykorgan, as well as by the identification of local factors affecting the comfort of the residential environment. The second provision is proven through the structuring of factor groups and their relationship with the microclimatic conditions of the site. The third provision is disclosed in the author's model and in the system of differentiated recommendations, which confirms the applied potential of the research.</p> <p>For each provision: proven; not trivial; new; level of application - wide; confirmed by publications.</p>
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8.	Principle of reliability. Reliability of sources and information provided	<p>8.1 The choice of methodology is substantiated or the methodology is described in sufficient detail: 1) <u>yes;</u> 2) 2) no.</p>	The research methodology is substantiated and described in sufficient detail. The work is based on a comprehensive approach that includes historical-theoretical analysis, comparative analysis of international and Kazakhstani experience, systematization of factors, graphic-analytical interpretation of open climatic and urban planning data, and typological generalization of design techniques.
8.	Principle of reliability. Reliability of sources and information provided	<p>8.2 The results of the dissertation work were obtained using modern methods of scientific research and methods of data processing and interpretation with the application of computer technologies: 1) <u>yes;</u> 2) no.</p>	The results were obtained using modern scientific approaches to architectural analysis and data interpretation. The use of open climatic databases, cartographic materials, graphic-analytical diagrams, comparative tables, and visual models makes it possible to present the study area as a heterogeneous system requiring a differentiated design response.
8.	Principle of reliability. Reliability of sources and information provided	<p>8.3 Theoretical conclusions, models, identified relationships, and patterns are proven and confirmed by the research: 1) <u>yes;</u> 2) no.</p>	The theoretical conclusions and identified relationships are confirmed by the results of comparative, typological, and graphic-analytical analysis. For a dissertation in the field of architecture, which is predominantly theoretical and methodological in nature, the presented level of evidence is acceptable: the author demonstrates the relationship between microclimatic conditions, the morphology of development, and architectural techniques for shaping housing.
8.	Principle of	8.4 Important statements are	Important statements are supported by references to contemporary domestic

	reliability. Reliability of sources and information provided	confirmed/partially confirmed/not confirmed by references to current and reliable scientific literature:	and international literature on bioclimatic architecture, sustainable housing, climate-adaptive design, energy efficiency, and urban planning analysis. The source base makes it possible to reveal the degree of development of the problem and to show the place of the dissertation within the existing scientific field.
8.	Principle of reliability. Reliability of sources and information provided	8.5 The literature sources used are/are not sufficient for the literature review:	The sources used are sufficient to reveal the topic. The literature review covers the key areas: the theory of bioclimatic architecture, sustainable development of the urban environment, climate-adaptive design, low-rise housing, regional architecture of Kazakhstan, and methods for analyzing microclimatic conditions.
9.	Principle of practical value	9.1 The dissertation has theoretical significance: 1) yes; 2) no.	The dissertation has theoretical significance, as it clarifies the understanding of bioclimatic architecture for low-rise urban housing as a system of design solutions determined not only by the regional climate but also by the local microclimatic situation of the site. The work forms a basis for further research in the field of climate-adaptive architecture and regional housing typology.
9.	Principle of practical value	9.2 The dissertation has practical significance and there is a high probability of applying the results in practice: 1) yes; 2) no.	The practical significance of the dissertation is expressed in the possibility of using its results in pre-design site analysis, in developing recommendations for low-rise residential development, in the educational process of architectural design, and in preparing methodological materials on sustainable architecture. The classification of microclimatic situations and the sets of differentiated design solutions are the most applicable results.
9.	Principle of practical value	9.3 Are the proposals for practice new? 1) completely new; 2) partially new (25-75% are new); 3) 3) not new.	The proposals for practice are new. Their scientific and practical value lies in the systematic adaptation of known bioclimatic techniques to the local conditions of Southeastern Kazakhstan and in linking them to specific microclimatic zones. This approach increases the targeted nature of the design recommendations and can be used by architects and design organizations.
10.	Quality of writing and formatting	Quality of academic writing: 1) high; 2) average; 3) below average; 4) 4) low.	The quality of academic writing is assessed as high. The dissertation text is presented in a scientific style, the structure of the work is logical, and the main provisions are formulated consistently. Illustrative materials, diagrams, tables, and models supplement the content of the study and contribute to the disclosure of the topic.
11.	Comments on the dissertation	Reviewer's comments.	1. In certain parts of the work, it would be advisable to distinguish more consistently between the concepts of "microclimatic zoning" and "microclimatic differentiation," since the latter concept has a broader

			<p>methodological meaning in the dissertation.</p> <p>2. Some practical recommendations could be supplemented with a brief indication of the priority of their application for each of the three cities.</p> <p>These comments are advisory in nature and do not reduce the overall scientific and practical value of the dissertation work.</p>
12.	Scientific level of the doctoral candidate's articles on the research topic	Assessment of the scientific level of publications.	<p>The results of the dissertation research are reflected in the author's published scientific works, including an article in an international peer-reviewed journal indexed in Scopus, an article in Project Baikal, a publication in the QazBSQA Bulletin, and materials of an international scientific and practical conference. The most significant publication is the article by Sakenova S.M. et al., "Conformation Factors of Building Bioclimatic Microclimate," Civil Engineering and Architecture, 12(1), 350-360, 2024, DOI: 10.13189/cea.2024.120126. The publications correspond to the dissertation topic, reveal the key theoretical and methodological provisions of the research, and confirm the scientific validity of the results obtained.</p>
13.	Decision of the official reviewer	Final decision.	<p>The dissertation work of Saya Meirkhanovna Sakenova on the topic "Specific Features of the Development of Bioclimatic Architecture for Low-Rise Urban Housing in Southeastern Kazakhstan," submitted for the degree of Doctor of Philosophy (PhD) in the educational program 8D07311 - "Architecture," meets the requirements established for dissertations submitted for the degree of Doctor of Philosophy (PhD). I consider it possible to petition the Committee to award Saya Meirkhanovna Sakenova the degree of Doctor of Philosophy (PhD) in the educational program 8D07311 - "Architecture."</p>

Official reviewer
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