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DOCTORAL DISSERTATION REVIEW

Mr Adhitya RAHMANA, MSc

„The Transition of Forest-Based Bioeconomy in Indonesia's Rural Area: Key Factors and Policy Implications”

prepared under the guidance of scientists:
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By letter dated May 5, 2026 (BON.5100.21.2026), the Chairwoman of the Scientific Council Disciplinary for Economics and Finance at Warsaw University of Life Sciences, dr hab. Barbara Gołębiewska, Professor of Warsaw University of Life Sciences (SGGW), entrusted me with reviewing the doctoral dissertation of Mr Adhitya RAHMANA on "*The Transition of Forest-Based Bioeconomy in Indonesia's Rural Area: Key Factors and Policy Implications*." The topic and scope of the dissertation fall within the social sciences, the discipline of economics and finance.

The submitted dissertation was evaluated based on the originality of its solution to the research problem, the demonstration of the PhD candidate's knowledge of the discipline, and the ability to conduct independent research.

After reading the dissertation, I present my assessments, comments and conclusion.

1. The Relevance of the Dissertation Topic

In evaluating the dissertation submitted for review, the significance and importance of the problem undertaken by the Doctoral Candidate must be emphasised.

This dissertation addresses the development of rural areas in Indonesia, a country with significant potential for developing a highly competitive forest-based bioeconomy. The need to implement a bioeconomy stems from contemporary environmental, economic, and social challenges. The concept of a green economy is particularly important in rural and less developed areas, contributing to improving the economic and environmental sustainability of

these areas. Social capital also plays a significant role, which the Doctoral Candidate aptly notes and broadly incorporates into his research.

A lack of trust in institutions and a strong attachment to existing practices limit the pace of implementation of forest bioeconomy models. Consequently, this leads to the marginalization of local communities. Therefore, effective implementation of a bioeconomy requires adapting development strategies to local economic, social, and cultural conditions.

Rural areas in Indonesia have significant potential for implementing a forest-based bioeconomy. This development direction promotes positive changes and benefits in many areas of the region's functioning. The issue aligns with current and important research directions in the bioeconomy. This topic, especially in relation to forest resources and rural development, is enjoying increasing interest among researchers.

In light of the above, I consider the choice of the dissertation topic to be cognitively and appliedly significant.

2. Structure of the thesis

The dissertation consists of 200 typewritten pages, including an appendix. The thesis contains 31 tables, 25 figures, and an appendix containing two research questionnaires. The figures and tables are closely linked to the text, enhancing the substantive value and clarity of the presented content.

The thesis begins with an abstract in English (p. 8) and an abstract in Polish (p. 9). The introduction provides introductory information on the issues discussed and justification for the topic selection (pp. 10-11). The main body of the thesis comprises four chapters, while chapter five (erroneously marked as sixth) contains conclusions. Chapter one (*Research Methodology*, pp. 12-34) presents the research methodology, preceded by philosophical considerations concerning the issues discussed and a justification of the adopted methodological assumptions. Chapter two presents the theoretical foundations and conceptual framework of forest-based bioeconomy transition (pp. 35-60). Chapter three is devoted to the current situation of the forest-based bioeconomy in Indonesia (*Current Condition of Forest-Based Bioeconomy in Indonesia*, pp. 61-83). It presents the potential of forest resources in the country's economy and policies supporting the development of the bioeconomy. It highlights the key role of small forest enterprises in the sustainable development of rural areas, while also highlighting the low efficiency of these enterprises and the barriers to bioeconomic transformation.

The research results are presented in chapter four (*Divergent Pathways in Indonesia's Bioeconomy: Comparison of Bamboo and Teak Industries*, pp. 84-147). This is the most

important part of the dissertation, divided into five subchapters, properly distinguished and justified by the specific nature of the analysis. The subchapter titles reflect the substantive scope of the work and the analysis based on the source material. The main part of the dissertation concludes with conclusions presented in the chapter designated by the author as the sixth (in fact, it is the fifth chapter). The structure of the dissertation stems from the specificity of the analysed issue and the adopted research approach. The chapter and subchapter titles accurately reflect the scope of the issues discussed. The dissertation has been carefully prepared, drawing on extensive English-language literature. The selection of sources is extensive (261 items) and meets high standards.

Analyzing the content of the individual chapters and subchapters, it is noticeable that the hypotheses are presented in the first chapter (1.3 *Research hypotheses*, p. 14), while their development is in the second chapter (2.7 *Conceptual framework and formulation of hypotheses*, pp. 57-59).

It seems more appropriate to place a theoretical chapter at the beginning of the dissertation, including the research hypotheses. This approach would reduce the need to refer to other sections of the dissertation and allow for greater coherence.

This comment should be considered a suggestion to improve the structure of the dissertation upon its eventual publication.

3. Merit Assessment of the Dissertation

This dissertation addresses the economic development of rural Indonesia, a country with significant potential for developing a forest-based bioeconomy, which simultaneously faces numerous constraints and barriers to development.

The content of the dissertation corresponds to its title, and the text is clear and readable. The broad approach to the analysed issue, taking into account economic, environmental, social, and cultural aspects, is noteworthy. The entire dissertation focuses on analysing the determinants of the transformation process of a forest-based economy in rural Indonesia and developing recommendations for public policy aimed at streamlining this process.

I highly value the selection of the topic, the concept, the research method, and the interpretation of the results. The reviewed dissertation has significant scientific and cognitive value. The literature review includes the most important scientific achievements published in renowned, leading scientific journals of high international standing.

3.1.Problem Statement, Research Questions, Objectives, and Hypotheses

Transitioning to a bioeconomy is often seen as a solution for balancing environmental protection with national economic growth. However, this macro-level concept often encounters barriers when implemented at the local level. Implementing a bioeconomy in rural areas requires considering the social and cultural ties that connect local communities, which are often overlooked in national policies. Consequently, achieving the expected results becomes significantly more difficult. This doctoral candidate attempted to explain: 1) the reasons for the limited effectiveness of implementing the forest bioeconomy concept in rural Indonesia, and 2) how entrepreneurs in the timber sector perceive environmental values, which is crucial for successful economic transformation.

The author aptly identifies a research gap related to the lack of in-depth empirical analyses of the interactions between entrepreneurial behaviour and local ecosystems. Research in this area is crucial for shaping effective economic policy for rural areas.

Four research questions were formulated to analyse the phenomenon under investigation (p. 13). The research focused on analysing the interactions between entrepreneurial behaviour and local ecosystems and designing better solutions for bioeconomy development policy in Indonesia. This research is built on three pillars: entrepreneurship for value creation, technological innovation for efficiency, and socio-ecological resilience for sustainability. Based on these pillars, the study compares capital-intensive teak furniture businesses with community-based bamboo craft enterprises. Teak and bamboo represent two opposite sides of Indonesia's forest bioeconomy.

The goal of the research was to find ways to balance rural profits with environmental protection (p. 14). To achieve this, four specific objectives were formulated.

The research questions and objectives of the dissertation were formulated correctly and capture the most important issues addressed in the research. The use of the term "*main factors*" (in research question RQ1) is debatable, as criteria distinguishing them from other factors, such as specific factors, were not identified. It seems that this term can be omitted and the factors influencing the phenomenon under study can be analysed.

To achieve the adopted goal, seven research hypotheses were formulated and verified in the studies (pp. 14-15). It should be acknowledged that the formulation of the hypotheses itself raises no major objections, although some doubts may arise regarding the fifth hypothesis (H5), according to which "*Entrepreneurial Ecosystem (EES) directly and positively impacts*

Bioeconomic Transformation Intentions (BOT)." The author uses the phrase "*directly and positively*" while in the remaining hypotheses he uses only the term "*positively*." This raises the question of whether this means that in other cases this impact is something other than direct, e.g., indirect. This issue is worth clarifying.

3.2.Evaluation of the Research Procedure

The research procedure consisted of three main stages (p. 15-17). The first stage identified factors determining the readiness of local entrepreneurs to transform towards a bioeconomy. The second stage analysed the interdependencies between the elements of the entrepreneurial ecosystem and identified key causal factors. In the final stage, based on the obtained results, recommendations were formulated and priority areas for public policy action were identified. The research involved a comparison of capital-intensive enterprises producing teak furniture with local small enterprises engaged in bamboo crafts.

The research methodology employed both quantitative and qualitative methods. The quantitative research covered 150 entrepreneurs representing micro and small businesses (75 from the teak sector and 75 from the bamboo sector). Purposive sampling was employed. Ten experts, association leaders and community group heads, participated in the qualitative research – the Expert Panel for Fuzzy-DEMATEL.

Appropriate research techniques and tools were assigned to each method. Empirical data from local enterprises was collected using a research questionnaire (Annex 1). In the second phase, targeted interviews with experts were conducted to analyse Fuzzy-DEMATEL causal maps (Annex 2). The methods chosen to achieve the research objectives were appropriate. The research procedure was described in detail and clearly (pp. 15-22).

Summarising the evaluation of the selected methods and tools and the ability to apply them, it should be noted that the author demonstrated originality and skill in conducting research projects.

The results are notable, have remarkable cognitive significance, and may also have practical implications. The "*Conclusions*" section presents the research results in relation to the formulated research questions and hypotheses. The study compared entrepreneurial ecosystems in the teak furniture and bamboo handicraft sectors. The research results indicate that the transformation of the forest bioeconomy is proceeding differently in each sector. This is due to the fact that local forest resources, due to their characteristics, influence the direction and course of transformation in each industry.

Regarding the factors determining the transformation of the bioeconomy in the rural forestry sector, it was found that in the case of the traditional teak processing sector, the transformation is determined primarily by technological conditions and the need to adapt to changing operating conditions. This is a response to serious raw material shortages and outdated production potential, enabling enterprises to maintain competitiveness and continue operating. In the bamboo-based sector, however, the transformation is primarily shaped by social factors. Collaboration and mutual support between local communities, the pursuit of expanding market reach, and the desire to preserve and pass on family heritage and business values to future generations play a key role in this process.

Regarding entrepreneurial behavior toward the bioeconomy, the analysis revealed that readiness to implement bioeconomic solutions varies across the sectors studied. In the teak sector, the ability to utilise new technologies is crucial, while environmental considerations play a minor role if they do not yield direct economic benefits. In the bamboo sector, on the other hand, readiness for change stems primarily from social and environmental values. This means that the implementation of new solutions depends more on their compatibility with local values and culture than on the availability of technology itself.

The observations regarding the role of social capital in the transformation of the forest bioeconomy in Indonesia are interesting. In the bamboo sector, cultural conditions and social norms have the greatest influence. This means that social trust and informal relationships compensate to some extent for insufficient institutional support. In the case of the teak sector, however, consumer preferences and access to financing play a key role. At the same time, it was noted that the sustainable development of the bioeconomy requires the active involvement of public administration and the scientific community.

The results indicate that there is no single, universal model for supporting the transformation of the forest bioeconomy. In the teak sector, financial support, including preferential investment loans and funds for technology modernization, is of paramount importance. In the bamboo sector, on the other hand, efforts should focus on developing institutions that support entrepreneurship, strengthening the capacity of local communities, and facilitating access to markets. Effective public policy should take into account local conditions. This will allow for the gradual development of sustainable and organised bioeconomy value chains. This provides valuable guidance for decision-makers responsible for shaping economic policy.

The Author's consideration of the limitations of the research conducted, discussion of its practical implications and indication of directions for further research deserve a positive assessment.

After reading the dissertation, a general remark (comment) comes to mind. The Author often uses highly embellished language, such as "*scientific landscape analysis*" or "*calibrating to ecological carrying capacities*," among others. This likely stems from the Author's humanistic approach to the subject, which is evident throughout the text. However, in research works, precise language is more persuasive.

Certainly, some of the comments presented in this assessment are debatable, and others require clarification.

Final Conclusion

This dissertation examines the mechanisms of transformation of the forest bioeconomy in rural Indonesia. It is important to emphasise the multifaceted nature of the dissertation and its interdisciplinary nature. It is also important to emphasise that the author took on the challenges inherent in the implementation of this dissertation. The first challenge stems from the complexity of the subject matter under study. The author attempted to examine the development of a forest-based bioeconomy from several perspectives: economic, political, social, and cultural. This required a crucial combination of economic and sociological knowledge. The second challenge was empirical in nature. It involved conducting in-depth research in the complex realities of rural areas, involving a specific group of entities operating in both the teak and bamboo sectors. It is worth noting that the PhD candidate successfully met these challenges.

This dissertation constitutes an important addition to research into the mechanisms of transformation of the forest bioeconomy based on the example of Indonesia. It provides an original solution to a scientific problem and contributes new values to the social sciences, including the disciplines of economics and finance. The dissertation also has significant practical value. The Doctoral Candidate demonstrated the ability to independently solve a research problem, select methods, and draw appropriate conclusions.

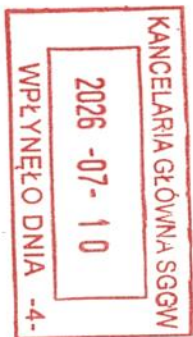
The dissertation submitted for review meets the requirements for doctoral theses, as defined in the Act of July 20, 2018, the Law on Higher Education and Science (Journal of Laws of 2024, item 1571, as amended).

In light of the above, I respectfully recommend that the Scientific Council of the Discipline of Economics and Finance of Warsaw University of Life Sciences accept the dissertation by Adhitya Rahmana entitled "*The Transition of Forest-Based Bioeconomy in Indonesia's Rural Area: Key Factors and Policy Implications*" as a doctoral dissertation and admit it to the public defence.

A handwritten signature in blue ink, appearing to read 'Zdzisław Ciesielski', is positioned above the date.

Białystok, 06.07.2026

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