THE IMPACT OF GREEN BANKING PRACTICES ON ENVIRONMENTAL PERFORMANCE OF COMMERCIAL BANKS IN HO CHI MINH CITY IN THE CONTEXT OF CLIMATE CHANGE

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ABSTRACT

Vietnamese banks play a crucial role in facilitating the transition toward a green and environmentally sustainable economy. This study aims to develop a comprehensive theoretical framework and empirically assess the relationship between green banking practices and environmental performance, with a specific focus on the mediating roles of green finance, the social enterprise support ecosystem, and green product innovation. The research focuses on commercial banks in Ho Chi Minh City, particularly those with strong green banking disclosure rankings during the 2016-2022 period. Primary data was collected via an online survey, resulting in 143 valid responses after screening. The data was analyzed using measurement models, structural equation modeling, and hypothesis testing through the bootstrapping technique. The findings reveal that green banking practices significantly enhance environmental performance through the mediating role of green finance. Moreover, green finance directly improves environmental performance and indirectly influences it via the social enterprise support ecosystem and green product innovation. This study contributes to the sustainable finance literature by empirically validating the mediating roles of green finance and innovation in shaping banks' environmental performance. Based on these insights, the study proposes several recommendations to enhance green banking in Vietnam.

Keywords: Environmental Performance, Green Banking Practices, Green Finance, Green Product Innovation, Social Enterprise Ecosystem.

1. INTRODUCTION

Climate change poses one of the most pressing challenges of the 21st century, with profound impacts on ecosystems, human well-being, and economic stability. In Vietnam, among the fastest-growing greenhouse gas emitters, losses reached 10 billion USD in 2020 and could climb to 523 billion USD by 2050 [21]. These figures underscore the urgent need to shift from a brown to a green economy. As one of the ten cities most vulnerable to climate change, Ho Chi Minh City aims to become a "green city" by advancing a green economy, in which green banking plays a vital role in mobilizing financial resources and promoting sustainable business growth.

The implementation of green banking in Vietnam officially began in 2015 with the issuance of Directive No. 03/CT-NHNN by the State Bank of Vietnam (SBV), urging commercial banks to promote green credit for environmentally focused projects. This initiative was further reinforced by Decision No. 1604/QĐ-NHNN in 2018 and Circular No. 17/2022/TT-NHNN, which outlined specific goals for greening the banking sector. Major banks such as BIDV, Vietcombank, and Agribank have actively adopted green finance practices, including issuing green bonds, offering preferential loan packages, and financing renewable energy and sustainable agriculture projects. By 2025, Vietnam aims for 100% of banks to establish internal regulations and conduct environmental and social risk assessments in credit activities.

Green banking practices encompass banking operations, policies, staff engagement, and customer interactions, all of which contribute significantly to promoting green finance and improving environmental performance. Specifically, banks align internal activities and policies to foster environmental awareness, reduce negative environmental impacts, and address climate change. Furthermore, banks facilitate customer access to green financial products, integrate environmental risk assessments into lending decisions, and support environmentally focused projects [3].

Previous studies have examined the role of green banking in promoting environmental performance [7,16,23], but few have explored the mediating mechanisms involving green finance and innovation in the Vietnamese context. This study aims to fill the gap by addressing the following research questions: (1) How do green banking practices affect environmental performance? (2) What are the mediating roles of green finance, ecosystem support, and product innovation?.

Recognizing this, the research team decided to undertake the study titled "The Impact of Green Banking Practices on Environmental Performance in Commercial Banks in Ho Chi Minh City in the Context of Climate Change" with the aim of contributing to the body of scientific research and proposing ideas and solutions to promote the adoption of green banking practices in the present day.

2. LITERATURE REVIEW

In response to the urgent call for action against accelerating climate change impacts, green banking practices (GBP) have become a strategic focus for commercial banks aiming to integrate sustainability into their operations while maintaining profitability. These practices not only enhance operational efficiency and reduce environmentally harmful activities but also promote the growth of green finance (GF) by funding eco-friendly and socially responsible projects [11,23]. Through instruments such as green credit and green bonds, GBP plays a vital role in expanding access to capital for sustainable development initiatives, thereby supporting the positive relationship between GBP and GF (H1), as well as directly contributing to improved environmental performance (EP) (H2). Furthermore, GF serves as a critical mediating mechanism, enabling the translation of banking sustainability efforts into measurable environmental outcomes through better data, risk assessment, and investment targeting [14,16], supporting the mediating role proposed in H3. At the same time, GF contributes to the development of the social enterprise ecosystem (SEE) by offering diverse financing sources that foster collaboration, liquidity, and innovation across socially and environmentally oriented organizations [15], thereby supporting H4. This ecosystem, in turn, strengthens green product innovation (GPI) by facilitating partnerships, knowledge sharing, and institutional support for sustainable solutions [4,6], supporting H5. Ultimately, these innovations enhance environmental performance by promoting clean technologies, renewable energy, and eco-friendly products, reinforcing the positive impact of GPI on EP as stated in H6 [13].

H1: Green banking practices (GBP) have a positive impact on green finance (GF).

H2: Green banking practices (GBP) have a positive impact on environmental performance (EP).

H3: Green finance (GF) mediates the relationship between green banking practices (GBP) and environmental performance (EP).

H4: Green finance (GF) has a positive impact on the social enterprise ecosystem (SEE).

H5: The social enterprise ecosystem (SEE) has a positive impact on green product innovation (GPI).

H6: Green product innovation (GPI) has a positive impact on environmental performance (EP).

H7: The social enterprise ecosystem (SEE) and green product innovation (GPI) jointly mediate the relationship between green finance (GF) and environmental performance (EP).

3. CONCEPTUAL FRAMEWORK

Green banking practices have a clearly positive impact on environmental performance, with green finance playing a key mediating role. Specifically, the adoption of green banking policies and activities not only promotes the development of green finance but also contributes to the overall improvement of banks' environmental efficiency [2]. Moreover, green finance serves as a vital link between banks and the broader sustainability-supporting ecosystem, particularly by supporting social enterprises and driving green product innovation [1,7,10,12,13]. These elements help to amplify the positive environmental impact while also laying the foundation for long-term, sustainable growth in the banking sector. Based on these relationships, the conceptual framework of the present study is illustrated in Figure 3.1.1.
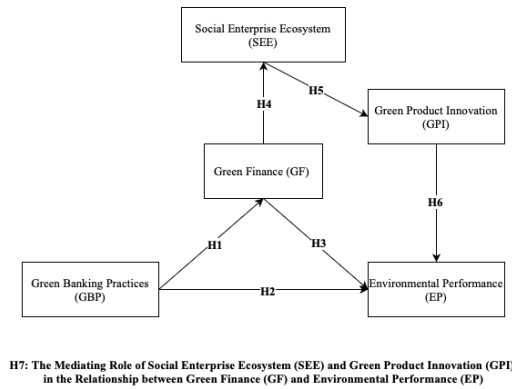

Figure 3.1. Conceptual Framework

Source: Research team synthesis

4. MATERIALS AND METHODS

4.1. Data Collection

This study employed a purposive sampling approach to ensure that respondents possessed relevant experience with green banking initiatives. Five commercial banks in Ho Chi Minh City: Asia Commercial Bank (ACB), Military Bank (MBBank), Ho Chi Minh City Development Bank (HDBank), Sai Gon–Hanoi Bank (SHB), and Vietcombank (VCB) were selected because they achieved high green-disclosure scores (7–10 points) in the State Bank of Vietnam's 2022 assessment. A total of 143 valid responses were obtained. Although this sample size is modest, purposive sampling ensured that participants were knowledgeable about their institutions' green practices, thereby enhancing the internal validity of the findings.

Primary data were collected via an online questionnaire administered between January 15 and March 31, 2025. The survey link was distributed by e-mail and via closed industry groups on Facebook, targeting staff, officers, and managers directly involved

in sustainability or credit-approval functions. Prior to analysis, responses were screened for completeness and consistency; only fully completed questionnaires with no more than one missing item per construct were retained. All items were measured on a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree"), as is standard practice in survey research.

4.2. Data Analysis

The data were processed and analyzed using SmartPLS 3 software, a tool for partial least-squares structural equation modeling (PLS-SEM). First, descriptive statistics (mean and standard deviation) were computed for all constructs. Next, we assessed the measurement model by evaluating internal consistency (Cronbach's α and composite reliability) and convergent validity (average variance extracted, AVE) according to recommended thresholds (e.g. $\alpha \geq 0.70$). Discriminant validity was examined using both the Fornell–Larcker criterion (requiring each construct's AVE to exceed its squared correlations with other constructs) and the heterotrait–monotrait ratio (HTMT). Finally, the structural model was evaluated by checking for multicollinearity (variance inflation factor, VIF), estimating the coefficients of determination (R^2) and effect sizes (f^2), and testing path significance via bootstrapping (5,000 resamples). In line with Hair et al. (2017), VIF values below 5 (and ideally below 3) indicate no serious multicollinearity. Hypotheses were tested by examining the standardized path coefficients (β), t-statistics, and p-values for both direct and indirect effects.

4.3. Questionnaire Design

To ensure content validity and construct validity, the questionnaire was developed based on established scales from previous studies and was carefully adapted to the Vietnamese context. The constructs related to green banking practices (GBP), green finance (GF), and environmental performance (EP) were primarily drawn from [23], who designed their instrument based on an extensive review of green banking literature. For the social enterprise ecosystem (SEE), measurement items were developed based on [17], who emphasized the role of innovation ecosystems in generating market-aligned, impact-driven products; [19], who highlighted the importance of capacity-building and support programs for social enterprises; and the contextual relevance of banking practices in supporting green projects and assessing environmental risks. The green product innovation (GPI) scale was constructed using items from [2,18,20], focusing on product life cycle management, customer acceptance of green products, and environmentally responsible product development. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Prior to the full-scale survey, a pilot study was conducted with a small sample of professionals in banking and social enterprises to assess clarity, reliability, and contextual relevance.

Feedback from this pilot phase informed final adjustments to ensure linguistic appropriateness and enhance the questionnaire's validity within the Vietnamese setting.

5. RESULTS AND DISCUSSION

5.1. Results

5.1.1. Measurement Model Evaluation

The reliability and validity of the measurement scales were confirmed. Internal consistency was high: Cronbach's α values ranged from 0.792 to 0.880 across the six constructs (see Table 5.1.1). As recommended by [8] a Cronbach's alpha value of 0.70 or higher indicates acceptable internal consistency. Similarly, all composite reliability (CR) values exceeded the recommended threshold of 0.70 [8], satisfying conventional criteria for construct reliability.

Convergent validity was also achieved: the average variance extracted (AVE) values ranged from 0.615 to 0.709, all above the 0.50 cutoff [5]. These statistics indicate that each latent construct explains a satisfactory proportion of variance in its indicators. Table 5.1.1 summarizes the reliability (α), CR, and AVE for each construct.

Table 5.1.1. Construct reliability and validity

Constructs	Cronbach's alpha	Composite Reliability	Average variance extracted (AVE)
EP	0.854	0.902	0.696
GBP	0.880	0.913	0.677
GF	0.864	0.907	0.709
GPI	0.799	0.869	0.624
SEE	0.792	0.865	0.615

Source: Research team synthesis

Discriminant validity was established. As shown in Table 5.1.2, each construct's AVE square root (diagonal of the Fornell–Larcker matrix) exceeds all its correlations with other constructs, indicating distinctness of the constructs [5]. Moreover, all HTMT ratios were below 0.90 (see Table 5.1.3), the recommended threshold for discriminant validity. Together, these results confirm that the constructs are empirically distinct [9].

Table 5.1.2. Discriminant validity by using Fornell-Larcker criterion

Constructs	EP	GBP	GF	GPI	SEE
EP	0.834				
GBP	0.645	0.823			
GF	0.645	0.663	0.842		
GPI	0.595	0.404	0.403	0.790	
SEE	0.627	0.496	0.484	0.463	0.784

Source: Research team synthesis

Table 5.1.3. Discriminant validity by using HTMT criterion

Constructs	EP	GBP	GF	GPI	SEE
EP					
GBP	0.735				
GF	0.745	0.761			
GPI	0.715	0.477	0.482		
SEE	0.759	0.582	0.573	0.576	

Source: Research team synthesis

5.1.2. Structural Model Evaluation

Multicollinearity was not an issue. All variance inflation factors (VIF) for the predictor constructs were well below 5 (in fact, all VIFs were below 3), indicating no serious multicollinearity (Table 5.1.4).

Table 5.1.4. Variance inflation factors

Constructs	EP	GBP	GF	GPI	SEE
EP					
GBP	1.860		1.000		
GF	1.857				1.000

GPI	1.244	
SEE		1.000

The model's explanatory power was moderate to substantial. The coefficients of determination (R^2) are reported in Table 5.1.5. Notably, EP (environmental performance) and GF (green finance) have high R^2 values (0.599 and 0.440, respectively), indicating that the model explains a large portion of their variance. The R^2 value for the SEE (social enterprise ecosystem) construct is 0.234, indicating moderate explanatory power. Effect sizes (f^2) were computed following Gefen and Straub (2005). As shown in Table 5.1.5, the key predictors had small-to-medium f^2 effects. For example, GBP→GF was very strong ($f^2 = 0.785$). These values suggest that each antecedent construct has the expected magnitude of influence on its dependent construct.

Table 5.1.5. R^2, adjusted R^2, and f^2 effect sizes for endogenous variables

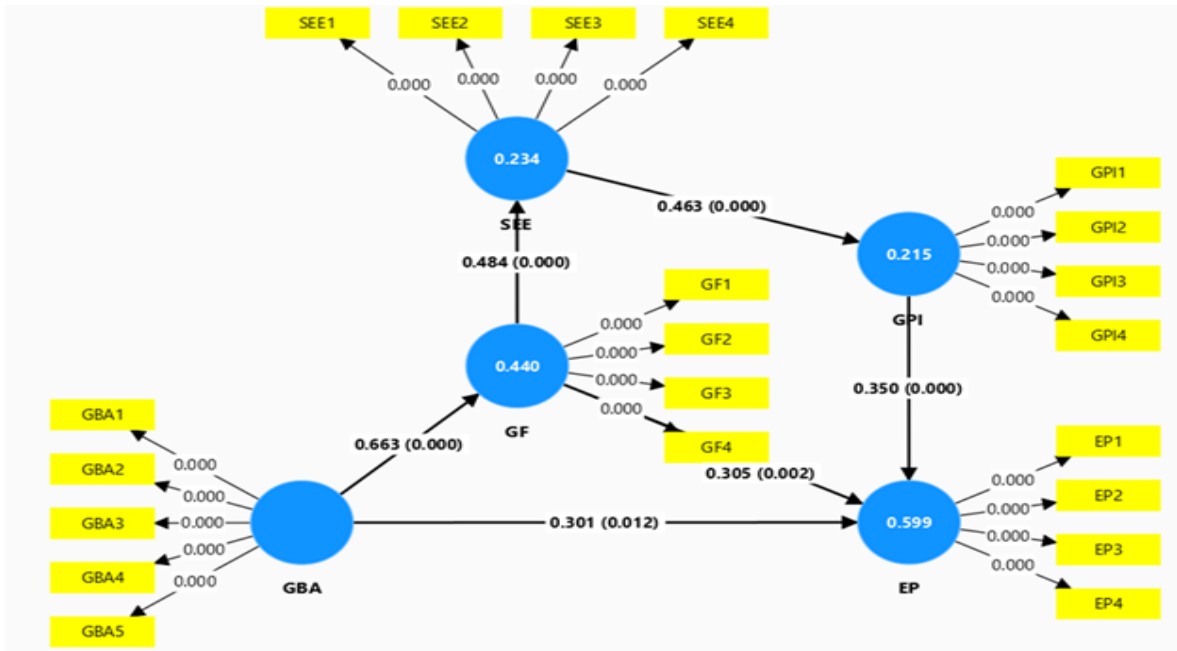| Dependent Variable	R^2	R^2_adj	Effect sizes (f^2)
EP	0.599	0.590	GBP→EP: 0.122 (small), GF→EP: 0.123 (small), GPI→EP: 0.248 (medium)
GF	0.440	0.436	GBP→GF: 0.785 (large)
GPI	0.215	0.209	SEE→GPI: 0.273 (medium)
SEE	0.234	0.228	GF→SEE: 0.305 (medium)

Figure 5.1.6. PLS-SEM diagram

Source: Research team synthesis

Finally, hypothesis tests via bootstrapping confirmed that all predicted paths were significant. Table 5.1.7 (top panel) reports the direct relationships: all five direct hypotheses (H1, H2, H4, H5, H6) were supported at p < 0.05. For example, GBP→GF (H1) had β = 0.663 (t = 10.570, p < 0.001), and GBP→EP (H2) had β = 0.301 (t = 2.517, p = 0.012). Similarly, GF→SEE (H4), SEE→GPI (H5), GPI→EP (H6), all yielded statistically significant coefficients (p < 0.001 for each). The indirect (mediated) effects in Table 5.1.7 (bottom panel) were also significant: H3 (GBP→GF→EP), H7 (GF→SEE→GPI→EP) both had p < 0.05. These results indicate that green finance, the social–ecological ecosystem (SEE), and product innovation jointly mediate the effects of green banking on environmental outcomes.

Table 5.1.7. Bootstrapped path coefficients for direct and indirect hypotheses

Hypothesis	β values	T statistics	P values	Conclusion
Direct Effect				
GBP → GF (H1)	0.663	10.570	0.000	Supported (strong)
GBP → EP (H2)	0.301	2.517	0.012	Supported (moderate)
GF → SEE (H4)	0.484	6.952	0.000	Supported (strong)

SEE → GPI (H5)	0.463	6.180	0.000	Supported (strong)
GPI → EP (H6)	0.352	4.173	0.000	Supported (moderate)
Indirect Effect				
GBP → GF → EP (H3)	0.105	2.696	0.007	Supported (mediation)
GF → SEE → GPI → EP (H7)	0.078	2.610	0.009	Supported (mediation)

Source: Research team synthesis

5.2. Discussion

The findings of this study support all seven proposed hypotheses, confirming the robustness and empirical validity of the research model. First, the significant positive relationship between green banking practices and green finance (H1) demonstrates that banks' sustainable initiatives such as green lending policies, paperless procedures, and energy-efficient operations successfully channel fresh capital into environmentally beneficial ventures. Equally, the direct effect of green banking practices on environmental performance (H2) reiterates earlier work, showing that both internal measures (e.g., reduced resource consumption) and external offerings (e.g., green loans) measurably shrink banks' ecological footprints [16,23]. This suggests that when banks effectively implement green banking practices such as issuing green loans or adopting environmentally responsible policies they can actively channel financial resources into environmentally beneficial projects.

Furthermore, the mediating role of green finance in enhancing environmental performance (H3) is well supported by previous studies, which highlight that green financial instruments such as green bonds and green deposits play a pivotal role in mobilizing capital for sustainable development [7,10, 23]. The present study corroborates this perspective by demonstrating that banks leveraging green finance mechanisms can better support projects aligned with ecological sustainability goals, including renewable energy, pollution control, and carbon reduction.

More importantly, this study goes beyond prior research by mapping a sequential mediation: green banking practices → green finance → social–ecological ecosystem support → green product innovation → environmental performance (H4–H6). While earlier studies have tested green finance or product innovation as independent mediators [7,10,12], our model reveals how ecosystem support acts as a

crucial bridge that amplifies the impact of financial instruments on innovation outcomes. This highlights the integrated role of ecosystem support and innovation within the sustainable finance framework. Innovation is not an isolated endeavor but one that requires an enabling ecosystem including policy mechanisms, infrastructure, stakeholder collaboration, and knowledge sharing [1].

These results reinforce the view that green innovation thrives within a vibrant, collaborative network: green finance not only mobilizes the necessary capital but also activates ecosystem engagement bringing together regulators, investors, and technical partners which in turn drives product innovation [13,22]. By empirically validating the social–ecological ecosystem's pivotal role in linking finance to innovation, our study demonstrates that only through this systematic interdependence can banks in emerging markets like Vietnam achieve the full environmental benefits of their sustainable initiatives.

The positive and significant effect of green product innovation on environmental performance (H6) aligns with the assertion that developing sustainable banking services, clean technologies, and eco-efficient processes is essential for achieving environmental targets [12]. Our findings build on this by demonstrating that such innovation thrives within a supportive ecosystem, one fostered by green finance and robust stakeholder networks. This perspective echoes the view that green innovation plays a pivotal role in driving sustainable outcomes across the banking industry [10].

Together, these findings provide robust evidence for a multi-level model in which environmental performance is not solely determined by green banking practices but is significantly shaped by intermediate constructs such as financial instruments, institutional support systems, and innovation capacity (H7). This holistic approach reflects a paradigm shift from isolated corporate environmental responsibility to an integrated, ecosystem-based framework for sustainable banking.

Our empirical findings both validate stakeholder and resource–based theories and extend them by identifying green finance and ecosystem innovation as key mediators. They show that Vietnamese banks' green policies not only enhance environmental outcomes but also drive financial performance so banks should embed green finance and innovation into their core strategies, and regulators ought to promote transparency and investment in green banking. Academically, this study advances sustainable banking literature by empirically linking green banking, finance, ecosystem support, innovation, environmental impact, spotlighting the mediating roles of the socio-environmental ecosystem and product innovation.

Limitations should be noted. The study used cross-sectional survey data from a modest sample (n=143) of urban bank employees, which may limit generalizability. All measures were self-reported, introducing potential common-method bias. Future

research could use longitudinal data and broader samples (including other regions or country contexts) to validate and extend these findings. Additionally, qualitative studies might explore the organizational processes by which green practices translate into performance outcomes.

Despite these limitations, the study's rigorous PLS-SEM analysis and strong results support the conclusion that sustainable banking strategies are environmentally beneficial in the Vietnamese context (and likely beyond).

6. CONCLUSION

This study examined how green banking practices influence environmental performance in Vietnamese banks. The results show that green banking has a direct positive effect on environmental performance and a strong effect on green finance. Green finance, in turn, fosters the wider sustainable ecosystem and product innovation, which together enhance environmental outcomes. All research hypotheses were supported, indicating a robust and logically coherent model.

The contributions of this research are threefold. First, it offers robust empirical evidence that green banking practices directly improve environmental outcomes; Second, it uncovers how green finance, ecosystem partnerships, and product innovation jointly mediate this effect, thereby extending models of sustainable finance; and third, it delivers actionable policy insights such as mandating standardized green-credit reporting, incentivizing ecosystem collaborations through preferential regulatory treatment, and encouraging banks to adopt clear environmental KPIs to guide regulators and institutions in emerging markets toward more effective, measurable sustainability strategies.

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ẢNH HƯỞNG CỦA THỰC HÀNH NGÂN HÀNG XANH ĐẾN HIỆU QUẢ MÔI TRƯỜNG TẠI CÁC NGÂN HÀNG THƯƠNG MẠI THÀNH PHỐ HỒ CHÍ MINH TRONG BỐI CẢNH BIẾN ĐỔI KHÍ HẬU

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TÓM TẮT

Các ngân hàng Việt Nam đóng vai trò quan trọng trong việc thúc đẩy quá trình chuyển đổi sang một nền kinh tế xanh và bền vững về môi trường. Nghiên cứu này nhằm xây dựng một khung lý thuyết toàn diện và đánh giá thực nghiệm mối quan hệ giữa các thực hành ngân hàng xanh và hiệu quả môi trường, với trọng tâm là vai trò trung gian của tài chính xanh, hệ sinh thái hỗ trợ doanh nghiệp xã hội và đổi mới sản phẩm xanh. Khách thể nghiên cứu là các ngân hàng thương mại tại Thành phố Hồ Chí Minh, đặc biệt là những ngân hàng có thứ hạng công bố ngân hàng xanh cao trong giai đoạn 2016-2022. Dữ liệu sơ cấp được thu thập thông qua khảo sát trực tuyến, thu được 143 phản hồi hợp lệ sau quá trình sàng lọc. Dữ liệu được phân tích bằng mô hình đo lường, mô hình cấu trúc và kiểm định giả thuyết thông qua kỹ thuật bootstrapping. Kết quả cho thấy, các thực hành ngân hàng xanh có ảnh hưởng tích cực đến hiệu quả môi trường thông qua vai trò trung gian của tài chính xanh. Bên cạnh đó, tài chính xanh tác động trực tiếp đến hiệu quả môi trường và gián tiếp ảnh hưởng thông qua hệ sinh thái hỗ trợ doanh nghiệp xã hội và đổi mới sản phẩm xanh. Nghiên cứu này đóng góp vào lĩnh vực tài chính bền vững bằng cách kiểm định thực nghiệm vai trò trung gian của tài chính xanh và đổi mới trong việc nâng cao hiệu quả môi trường của các ngân hàng. Dựa trên những phát hiện này, nhóm nghiên cứu đề xuất một số khuyến nghị nhằm thúc đẩy phát triển ngân hàng xanh tại Việt Nam.

Từ khoá: Hiệu quả môi trường, Thực hành ngân hàng xanh, Tài chính xanh, Đổi mới sản phẩm xanh, Hệ sinh thái hỗ trợ doanh nghiệp xã hội phát triển bền vững.

Lý Ngọc Yến Nhi sinh năm 1985 tại Bạc Liêu. Bà tốt nghiệp Tiến sĩ chuyên ngành Triết học năm 2025. Hiện nay, bà công tác tại Bộ môn Khoa học cơ bản, trường Đại học Ngoại thương Cơ sở II tại Thành phố Hồ Chí Minh.

Lĩnh vực nghiên cứu: Bình đẳng giới, Phát triển bền vững, Doanh nghiệp tạo tác động xã hội.

Phạm Thuý Vy sinh năm 2005 tại Tây Ninh. Hiện nay, cô là sinh viên chuyên ngành Kế toán - Kiểm toán, trường Đại học Ngoại thương Cơ sở II tại Thành phố Hồ Chí Minh.

Lĩnh vực nghiên cứu: Kinh tế và Kinh doanh.

Ngô Thuỵ Thảo Nguyên sinh năm 2005 tại Vũng Tàu. Hiện nay, cô là sinh viên chuyên ngành Kế toán - Kiểm toán, trường Đại học Ngoại thương Cơ sở II tại Thành phố Hồ Chí Minh.

Lĩnh vực nghiên cứu: Kinh tế và Kinh doanh.