DETERMINANTS OF FINANCING DECISIONS FOR RENEWABLE ENERGY PROJECTS: A CASE STUDY

Thuy Thi Thu Do *, Tuan Minh Tran **, Hoang Duc Le **, Long Phi Tran **, Giang Truong Cao **

* *Corresponding author*, School of Banking and Finance, National Economics University, Hanoi, Vietnam
Contact details: School of Banking and Finance, National Economics University, 207 Giai Phong Street, Hanoi, Vietnam
** School of Banking and Finance, National Economics University, Hanoi, Vietnam

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Abstract

Renewable energy sources have never been more affordable and are now significantly undercutting fossil fuels as the world's cheapest source of energy. Otherwise, it can benefit the environment, economy and society in the long term. However, financing and investment barriers play an important role in order to encourage renewable energy projects in Vietnam. In this research study on factors affecting investment decisions in renewable energy, along with behavioural and institutional theories, the authors have pointed out that financing decisions (FD) for energy projects in Vietnam are also influenced by non-financial factors. In this paper, we developed the model by using four factors: *a priori* beliefs (PB), institutional influence from legal obligations (IO), institutional influence from normative sources (IN), and knowledge of renewable energy operational context (KC). Structural equation modelling (SEM) is used to analyze determinants of the decision-making of financial institutions. Similar to Giang (2022), our result shows the important role of the PB in the effectiveness of renewable energy's existing policies and technological adequacy, KC as well as the IN in renewable energy FD of institutional investors. Meanwhile, IO does not impact the investors' willingness to finance renewable energy projects.

Keywords: Renewable Energy, Decision-Making, Financial Institution

Authors' individual contribution: Conceptualization —T.T.T.D. and G.T.C.; Methodology — T.M.T. and H.D.L.; Software — T.T.T.D., T.M.T., and L.P.T.; Formal Analysis — T.T.T.D., L.P.T., and G.T.C.; Resources — T.M.T. and L.P.T.; Data Curation — T.T.T.D.; Writing — Original Draft — T.T.T.D. and H.D.L.; Writing — Review & Editing — T.T.T.D. and H.D.L.; Visualization — H.D.L. and G.T.C.; Supervision — T.T.T.D.; Project Administration — T.T.T.D.; Funding Acquisition — T.T.T.D.

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1. INTRODUCTION

Vietnam has experienced an electricity shortage due to the demand for use significantly from 2021. Most reasons can be attributed to rapid economic growth, and increasing population that have contributed to rising electricity demand in Vietnam. Currently, problems of energy supply and use are not only related to global warming but also to environmental

concerns such as air pollution, acid precipitation, and ozone depletion. Therefore, renewable energy development has become the major concern of many countries around the world to maintain the current electricity supply as well as to minimize environmental impacts caused by fossil fuels. According to the (International Renewable Energy Agency [IRENA], 2020), by 2025, renewable energy will become the main source of electricity generation, providing a third of the world's electricity. Besides, Vietnam can become a regional leader in the energy transition and, therefore, governments should pay attention to take a holistic view of the energy transition.

Although the potential for renewable energy development in Vietnam is huge, the capital sources for renewable energy are still very modest, only 17/35 commercial banks participate in financing renewable energy. During the credit appraisal, banks encounter lots of obstacles: the terms of loans usually last for 10–15 years, in which case, banks have to face several limits to these projects (Nguyen, 2021). Moreover, the risks of capacity release as well as Vietnam Electricity's (EVN's) refusal to purchase electricity on projects of renewable energy make it much more difficult for banks to appraise the projects' efficiency. This situation shows that the understanding of factors that affect financial institutions in the process of capital allocation for renewable energy technology projects in general and renewable energy projects, in particular, is still limited. Therefore, studying finance for renewable energy enables the meeting of requirements for sustainability goals and financial realities, towards the transition to a cleaner and more sustainable energy future. There are several reasons to explain the role of financing for renewable projects such as cost minimisation, skills of attracting financial funds, risk management, good public policy and innovation. Finance skills foster innovation in renewable energy technologies and business models. By identifying new investment opportunities and optimizing financial structures, professionals contribute to industry growth and advancement. Knowledge of finance helps navigate complex regulatory environments and compliance requirements specific to renewable energy. Institutional investors can evaluate the environmental and social impacts of renewable energy projects alongside their financial aspects. This holistic approach ensures projects contribute positively to sustainability goals while remaining financially viable. Otherwise, renewable energy projects face risks such as regulatory changes, technological obsolescence, and market fluctuations. Institutional investors can aid in assessing and mitigating these risks, enhancing project stability and longevity. In addition, renewable energy projects often require substantial initial investments, finance skills help in managing costs effectively, optimizing budget allocation, and identifying cost-saving opportunities throughout the project lifecycle.

Previous studies have only mentioned the highlights of the issues surrounding development potential and general policies to support renewable energy projects in Vietnam without going into deep understanding and carefully examining the financial and non-financial factors that influence investors in financing renewable energy projects. The technological feasibility of a project has been identified as one of the most relevant barriers to the adoption of renewable energy. It is also regarded as one of the primary reasons leading to pitching sessions which introduced and interpreted the potential of projects (Hendry et al., 2010). We predict the potential attractiveness of a renewable energy project and the positive outlook an investor holds depending on his/her prior belief in technical and efficiency completion of renewable energy technology, knowledge of renewable energy operational context (KC) as well as the institutional influence from normative sources (IN) — a basis for evaluating investment opportunities. Since the economic survival of most renewable energy projects often depends on incentive mechanisms, the views and decisions of the investors are affected by the level of their confidence in the effectiveness of policies as well as support programs encouraging promotion and investment in renewable energy. Particularly, the uncertainty of public policies has been determined as a significant impediment to securing investment in renewable energy in the private sector (Barradale, 2010).

This study focuses on non-financial factors which affect the financing decisions (FD) on renewable energy projects in Vietnam, thereby proposing solutions and strategic renewable energy policies to develop energy systems in the long run.

The rest of this paper proceeds as follows. Section 2 provides the literature review. Section 3 describes the questionnaire design, concept and hypothesis. Section 4 shows the empirical results. Finally, Section 5 concludes the paper.

2. LITERATURE REVIEW

The literature on renewable energy including wind energy, solar power, biomass energy, and clean energy has devoted a great deal of attention to studying the factors affecting the success or failure of investments in clean energy projects and barriers to exploiting and investing in those energy sources. Scholars in this field have mainly focused on the technical and economic properties of energy systems and often applied a purely rational as a quantitative modelling approach to explaining how the effects of choice between alternatives in an uncertain environment. Various economic constraints to renewable energy development have been proposed, including high capital and maintenance costs (Jacobsson & Johnson, 2000); limited experience with new energy technologies (Jagadeesh, 2000); as well as underestimated the long-term benefits of investments that are good for the environment (Bradshaw & Borchers, 2000; Kilinc-Ata, 2023). A theoretical framework for renewable energy typically draws from various disciplines such as economics, engineering, environmental science, policy studies, and finance. It provides a structured approach to understanding the complex dynamics and interactions involved in the development, deployment, and sustainability of renewable energy technologies.

Rahmani et al. (2023) show the results that perceived risk is influenced by the regulatory framework, whereas investment attitudes are influenced by subjective norms and perceived risk. Moreover, they provide empirical findings that can

assist policymakers in the process of enabling households to invest in renewable energy projects, in green finance.

Technological diffusion, innovation systems, and technological trajectories explain how renewable energy technologies evolve over time (Shobande & Ogbeifun, 2023; Liu et al., 2023). This includes understanding factors that drive technological advancements, barriers to innovation, and the role of research and development.

Recently, other scholars have shown that rational technical-economic factors alone are not enough to explain barriers to investment, exploitation and development of renewable energy including wind power. They suggest a broader view that behavioural and social analysis should be combined. This view supports the use of social and behavioural theory to examine why people form particular views on issues and technologies related to the environment and suggests that the actual development of emerging technology such as renewable energy is influenced not only by technological performance but also by behavioural and cognitive factors.

However, despite this growing recognition in various fields, the behavioural aspect has not been studied much in terms of renewable energy finance. A recent stream of research papers has begun to incorporate investor perspectives to assess the effectiveness of renewable energy policies and shed light on how financial sector actors view policy tools. These studies have partly included investors' perspectives in the big-picture analysis of renewable energy investments, but they have also overlooked the role of non-financial and behavioural factors. Therefore, the new research only stops at the first step in better understanding the investment decision-making process in the field of renewable energy. Moreover, these documents focus on public finance, not much analysis of private capital sources poured into renewable energy such as capital from private investment institutions, domestic financial institutions and domestic financial institutions, as well as have not fully penetrated into the field of renewable energy.

The concept of *a priori* beliefs (PB) in the effectiveness of renewable energy policy refers to the pre-existing assumptions, attitudes, or expectations that stakeholders, policymakers, and the public hold regarding the outcomes and impacts of policies aimed at promoting renewable energy adoption (Evans et al., 2009; Olson-Hazboun et al., 2018). Investors seek clarity and consistency in renewable energy policies, such as feed-in tariffs, tax incentives, and renewable portfolio standards. A favourable regulatory environment reduces uncertainty and encourages investment (Bibri, 2021).

IN, such as international agreements, societal expectations, and ethical standards, indeed plays a significant role in shaping investment and FD for renewable energy projects. There is increasing societal pressure for businesses and investors to operate responsibly and contribute to environmental sustainability. Norms around corporate social responsibility (CSR) and environmental stewardship influence investment decisions favouring renewable energy projects. Investing in renewable energy projects can enhance long-term financial stability by diversifying portfolios and reducing exposure to fossil fuel price volatility and regulatory risks associated with carbon-intensive industries (Perea-Moreno, 2021).

Institutional influence from legal obligations (IO) can indeed have a complex and sometimes negative impact on investors' willingness to finance renewable energy projects. Renewable energy projects are subject to evolving regulatory frameworks, including permits, licenses, and environmental assessments. Uncertainty about future regulatory changes or compliance requirements can deter investors who seek stable and predictable investment environments. Legal obligations that favour incumbent energy sources or provide subsidies to traditional energy sectors can create market distortions. This may disadvantage renewable energy projects competing for capital and market share, reducing investor confidence in the sector's profitability (Lu et al., 2020).

Although behavioural factors have begun to be recognized in some areas, this view has not been applied to study whether investors allocate resources for renewable energy technologies or not. PB influences policymakers' preferences for specific types of renewable energy policies (e.g., subsidies, mandates, tax incentives). Beliefs inform the design of policy instruments, such as the level of financial support, duration of incentives, and targets for renewable energy deployment. This topic should be addressed, especially considering the impact of these factors on the current decision to finance and invest in renewable energy projects in Vietnam, which contributes highly oriented scientific research to promote and develop the process of financing and developing the renewable energy system in Vietnam.

3. RESEARCH METHODOLOGY

3.1. Questionnair design

The study design consisted of a combination of qualitative and quantitative methods and was divided into two phases. In the first phase, we conduct document analysis and interviews with experts along with fine-tuning the conceptual model and ensuring the validity of the content for different structures in the model. In the second phase, a web-based survey questionnaire was developed, pre-tested and presented to a sample of institutional investors in Vietnam.

Contact details for companies, organizations and their senior representatives are obtained from a variety of sources including institutional websites, government websites and other specialized directories. Additional resources include a list of participants in some of the most prestigious international conferences on sustainable energy finance. Overall, the list includes about 100 contacts in investment institutions and financial institutions operating in Vietnam. Investor profiles include venture capitalists, private equity funds, mixed funds, commercial banks, energy companies and associations of foreign institutional investors.

Prior to the launch of the survey, a pre-check with a limited number of investors from the sample and other stakeholders was conducted to validate measurements and refine research tools. Investors selected for the full survey received individual invitations via e-mail. Reminders are also sent at

regular intervals. To limit the impact of self-assessment and maximize the accuracy of our responses, we followed Huber and Power's (1985) principles: 1) guarantee that the information collected will be kept completely confidential; 2) agree to distribute a personalized feedback document, and 3) promise to share the final results of the study with respondents.

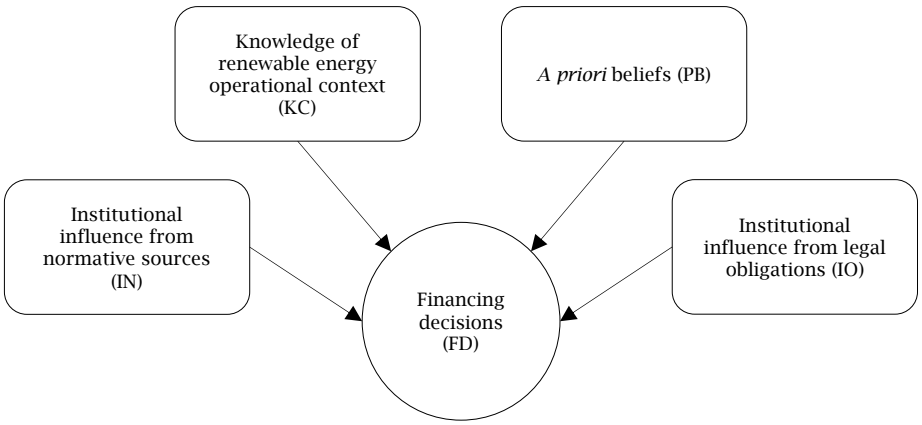
The survey process was conducted by the team from December 2021 to March 2023. Before conducting the survey, the research team had the opportunity to do in-depth interviews with several senior representatives of the investment organizations to understand more about their decision to finance renewable energy projects and confirm the appropriateness of the research model and scales. Investors selected for the full survey received individual invitations via e-mail, and reminders were sent at regular intervals.

The raw processed data will be processed in SPSS 20.0 software. Descriptive statistical methods are used to analyze frequency statistics and describe the characteristics of the sample, including the type of investment organization, renewable energy investment experience and proportion of renewable energy investment in the organization's portfolio. Data of the remaining variables of the study are analyzed through the following steps: scale reliability test (Cronbach's alpha), exploratory factor analysis (EFA), evaluate the scale by confirmatory factor analysis (CFA), test the model and the research hypotheses using structural equation modelling (SEM) and test the reliability of the model using Bootstrap technique.

3.2. Conceptual model

After researching a wide range of relevant documents and research about investing in renewable energy projects, as well as conducting deep interviews with some experts in the industry, we had the elementary base to develop the model which illustrates the relationship between non-financial factors to investing decisions in renewable energy projects in Vietnam. Like Giang (2022), the model is developed by four factors and presented in Figure 1 which shows that the FD will be affected by four main non-financial factors: PB, IO, IN, and KC.

Figure 1. Conceptual model



3.3. Hypotheses development

Institutional theorists and behavioural economists have long questioned the rational agent models of classical economics and proposed that cognitive and cultural factors, as well as personal beliefs, influence personal decisions (Kahneman, 2003). Masini (2013) argues that "many of the efforts conducted so far have been only moderately effective because by failing to understand the behavioral context in which investors make decisions, they have been unable to leverage some key drivers of the investment process". Scholars in the field of renewable energy examine the role of personal beliefs, particularly in the study of barriers to investment and the widespread development of clean energy technologies in general and renewable energy in particular.

We examine whether investors' transcendental beliefs affect their investing decisions in the technological feasibility of renewable energy and their confidence in the effectiveness of current energy policies. Thereby, we proposed the following hypothesis:

H1: A priori belief in the effectiveness of renewable energy policy and technology has a positive impact on an organization's decision to finance renewable energy projects.

A recent research study the gap in technical knowledge has become a barrier for institutional investors to make FD as well as for green energy projects to obtain bank loan approval (Mustapa et al., 2010; Amran et al., 2020). Therefore, a greater knowledge of the projects' operational knowledge makes investors more likely to make FD, and the proposed research hypothesis is as follows:

H2: Knowledge of operational context has a positive impact on the investors' willingness to finance renewable energy projects.

Masini and Menichetti (2012) indicate that agents or investors use two main sources of information to make their investment decisions: 1) the opinions of investors or external consultants, experts in the renewable energy industry; 2) factual information derived from technical reports or from

due diligence conducted by other organizations. Accordingly, the research team expects that the decision-making to finance or invest in renewable energy projects or the proportion of renewable energy segments in the investment portfolio will be affected by the sensitivity of the investors to these sources of information. Therefore, we propose the following hypothesis:

H3: Institutional influence from normative sources has a positive impact on investment and financing decisions for renewable energy projects.

According to institutional theory, the coercive isomorphic is constituted by pressure from other organizations on which the stated institution is dependent and pressure from the cultural expectations of the society. Coercive isomorphism indicates both direct and indirect pressures exerted on firms by other organizations upon which firms are dependent and by the expectations of the societies in which firms operate (DiMaggio & Powell, 1983). Based on the theory of coercive isomorphism as well as the theoretical overview of previous studies about the impact of regulations and institutional policies of the banking industry on the investors' willingness to make FD, the proposed research hypothesis is as follows:

H4: Institutional influence from legal obligations has a negative impact on the investors' willingness to finance renewable energy projects.

4. RESULTS

4.1. Current situation of financing renewable in Vietnam

Vietnam has recently witnessed a current trend in financing renewable energy. The Vietnamese government has set targets to increase the share of renewable energy in the total energy consumers aiming for 21% of total electricity generation from renewable sources and 50% of the energy mix by 2030, and 31% by 2045. According to a report of SSI Securities Corporation's (2022) on the electricity sector, in 2020, energy enterprises will issue VND 35,700 billion of bonds, which is an increase of 274% compared to 2019 (EVN, 2021). Many banks and financial institutions have expressed their interest in the development of renewable energy. Vietnam sharpens its policy and planning with respect to renewable energy. Vietnam strives to attract more investment in solar power, the country's abundant sunlight makes it suitable for solar power creation. Most recently, Vietnam Electrical Equipment Corporation (GELEX) decided to finance five wind power projects in Quang Tri, with the capacity of each plant being 30 MW. This might be due to the fact that the price mechanism of investment in wind and solar energy receives preferential treatment compared to coal and gas power, hence more bank credit can be accessed. On the other hand, Vietnam has developed hydropower and bioenergy simultaneously.

However, due to high financial leverage, lots of renewable energy, particularly wind projects in Vietnam are under bad debt pressure. Tat (2023) shows that the amount of bad debt from 34 renewable energy projects can reach up to VND 58 trillion, according to the Binh Thuan Wind and Solar Power Association. The biggest debts are recorded at Trung Nam Dak Lak 1 at VND 12 trillion, followed by BB Power Holdings with VND 11.5 trillion and Gia Lai Electricity at VND 10.6 trillion. According to FiinRatings and Indochine Counsel (2023), as of June 30, 2022, the outstanding credit for renewable energy is approximately VND 212 trillion (~ USD 9 billion), equivalent to 2.2% of gross domestic product (GDP), while the annual investment plan can translate to 3.3% of current GDP for the next 10 years. Even though this figure is not too large compared to the total credit balance, the capital mobilized by credit institutions is usually short-term and at the cost of commercial capital in the market. Moreover, another risk is that the majority of enterprises investing in renewable electricity today do not have strong financial capacity and experience. Besides, in 2021, EVN is estimated to cut down on 1.3 billion kWh of renewable energy, and this increases the risk for banks and financial investors (EVN, 2021). Currently, lots of banks and institutions have implemented green credit programs with green credit accounting for 3.6% of the total outstanding loans of the whole economy (Do et al., 2020), however, the credit from the programs to renewable energy projects in general is still small.

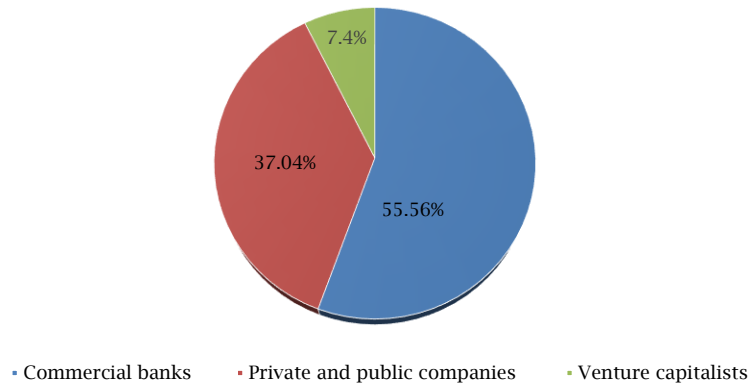
Vietnam needs to take a holistic view in order to attract international institutional investors to meet the country's goal of net-zero emissions by 2050, particularly in mitigating the risk of stranded assets, but gathering sufficient financial resources for renewable transition is not an easy task. Japan International Cooperation Agency (JICA) has signed a loan agreement worth USD 25 million for an onshore wind power project in Quang Tri province with a total generating capacity of 144 MW in 2021. This is JICA's first debt-financing renewable energy production project in Vietnam. International Finance Corporation (IFC) and the Managed Co-Lending Portfolio Program (MCPP) managed by IFC will provide a $57 million funding package to Thuan Binh Wind Power Joint Stock Company (TBW) to build two wind power plant projects. This funding package is for the construction of onshore wind power plants — Phu Lac 2 in Binh Thuan province and Loi Hai 2 in Ninh Thuan province, with a total capacity of over 54 MW. It is expected that the two wind power plants Phu Lac 2 and Loi Hai 2, which will start operating at the end of 2021, will produce about 170 million kWh of clean energy per year. Otherwise, HSBC Bank Vietnam has just confirmed the agreement to provide short-term green credit in the field of general contractor for the construction and installation of renewable energy projects for the Power Construction Joint Stock Company No. 1 (PCC1) — a leading Vietnamese company in energy construction general contractor (Hai, 2021). Military Commercial Joint Stock Bank (MB) has arranged capital for lots of wind energy projects, with a total of more than VND 60,000 billion, helping investors generate about 2,800 MW of renewable energy. Besides domestic projects, MB has arranged foreign capital for five wind energy projects in the form of a payment guarantee for the projects' loans from the Energy Coordinating Agency (ECA). With strong financial potential, MB intends to continue arranging capital for 1,000 MW of wind power in 2021. At the same time, MB also arranged the deal for the purchase of bonds issued by a domestic credit

institution to pay for construction and equipment costs to implement the Wind Power Plant project in Phong Lieu (Huỳnh, 2021). Asian Development Bank (ADB) has signed a green loan worth USD 116 million with Lien Lap Wind Power Joint Stock Company, Phong Huy Wind Power Joint Stock Company, and Phong Nguyen Wind Power Joint Stock Company to build and operate three wind power farms with a total capacity of 144 MW in Quang Tri Province, Vietnam (Nhat, 2021). This project will increase Vietnam's wind power capacity by 30% and help Vietnam meet its rapidly increasing energy demand. For wind power investment and development to unfold, specialized policies will be needed to promote capital inflows into wind power in a more efficient way, remove barriers, and take advantage of all the decision-making drivers to make investment decisions. However, up to now, in Vietnam, there have not been any in-depth studies that have been conducted to elucidate the factors affecting investment decisions in the field of renewable energy. In addition to financial criteria, non-financial factors affecting the decision-making process of financing renewable energy projects are also an attractive topic and a useful source of reference for policymakers to provide solutions to promote investment capital for renewable energy.

4.2. Sample

The survey focuses on experts of financial institutions joining renewable energy financing projects in Vietnam, along with international experts. The survey recorded 250 responses, 34 were returned but incomplete (rejected due to dissatisfaction). The number of verified samples inserted into the analysis was 216. Yun and Trumbo (2000) showed that response rates from e-mail surveys should be as high as 70%, but Saunders et al. (2015) argue that a response rate should be over 80%. The response rate in this study was 86.4% so it meets the considered requirements for conducting data analysis. The information is presented in Figure 2 as follows:

Figure 2. Respondents



The result shows that all respondents have engaged in projects related to investing in renewable energy. In particular, the majority of officers and specialists responding are working at commercial banks (55.56%), private and public companies (37.04%) and venture capitalists (7.4%). It is entirely understandable that the number of respondents in the banking sector is superior to other sectors in Vietnam and the results of the factors affecting renewable energy FD will be highly affected by the banking field.

4.3. Reliability

Table 1 shows the Cronbach's alpha analysis results in which all the Cronbach's alpha coefficients are greater than 0.7 with the result at the range between 0.723 and 0.899, respectively, so that the scale used in the research is considered highly reliable. The corrected item-total correlation is checked to eliminate variables with unsatisfactory correlation coefficients. In addition, the results show that all variables have correlation coefficients greater than 0.3. Therefore, the scale can be evaluated reliably and suitable for further analysis and evaluation.

Table 1. Results of scale's reliability

Factors	*Items*	*Cronbach's alpha*	*The minimum value of the corrected item-total correlation*
A priori beliefs (PB)	4	0.866	0.701
Knowledge of renewable energy operational context (KC)	4	0.723	0.464
Institutional influence from legal obligations (IO)	3	0.834	0.580
Institutional influence from normative sources (IN)	3	0.899	0.786
Renewable energy financing decisions (FD)	3	0.855	0.708

4.4. Pattern of correlations

EFA is used to explain the pattern of correlations for this sample. From Table 2, the Kaiser–Meyer–Olkin (KMO) coefficient = 0.752 > 0.5 was satisfactory and showed that the sample size of the study was appropriate for factor analysis. With the p-value of the significant coefficient of Bartlett's test = 0.000 < 0.05, we can confirm the null hypothesis of no correlation and it is satisfactory and statistically significant.

Table 2. KMO and Bartlett's test results

KMO measure of sampling adequacy		0.752
Bartlett's test of sphericity	Approx. Chi-square	1845.645
	df	136
	Sig.	0.000

The obtained values of the extraction sums of squared loadings as well as those of the initial eigenvalues were larger than one (1.345 > 1). The cumulative value of the extraction sums of squared loadings for five components was 72.792% which satisfies the requirement of greater than 50%. In addition, all the variables used have values of factor loadings greater than 0.5, indicating a practical significance.

Table 3. Total variance explained

Component	*Initial eigenvalues*		
	Total	*% of variance*	*Cumulative %*
1	4.481	26.361	26.361
2	2.718	15.988	42.350
3	2.226	13.094	55.443
4	1.604	9.436	64.880
5	1.345 > 1	7.913	72.792 > 50%

Based on the pattern matrix in Table 4, the input variables are classified into five large groups of samples with respect to rotation converged in five iterations.

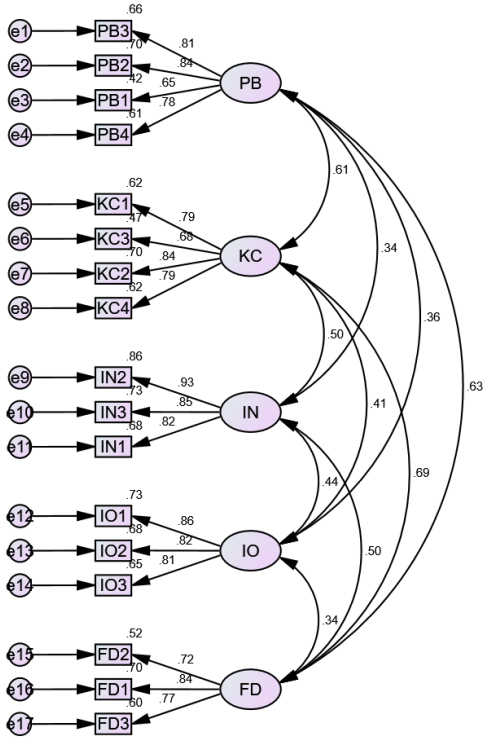
Table 4. Pattern matrix

Variable	*Component*				
	1	2	3	4	5
PB1	**0.924**				
PB3	**0.856**				
PB2	**0.853**				
PB4	**0.735**				
IO3		**0.921**			
IO2		**0.908**			
IO1		**0.900**			
FD3			**0.930**		
FD1			**0.865**		
FD2			**0.845**		
IN2				0.864	
IN1				0.863	
IN3				0.844	
KC3					0.813
KC1					0.771
KC2					0.684
KC4					0.671

4.5. Confirmatory factor analysis

Using the CFA in AMOS, the results extracted are as follows: x^2 (Chi-square) = 188.203; df = 109; p = 0.000; 1 < Chi-square / df = 1.727 < 3, indicating an acceptable fit between sample data and hypothetical model (Kline, 2011); comparative fit index (CFI) = 0.959 close to 1 indicates a good fit (Hooper et al., 2008) and meet the rule of thumb value as high 0.90. Goodness-of-fit index (GFI) = 0.904 (> 0.9) and root mean square error of approximation (RMSEA) = 0.060 < 0.08.

Figure 3. Confirmatory factor analysis results — Normalized form



Note: Chi-square / df = 1.727; GFI = 0.904; Tucker-Lewis Index (TLI) = 0.948; CFI = 0.959; RMSEA = 0.060.

The model fit test showed that the statistical model fits well with the set of observations. Additionally, the RMSEA result of 0.6 satisfies the requirement of Wolf and McQuitty (2013) for the goodness of fit model. Table 5 represents the reliability test that the composite reliability (CR) is greater than 0.7, proving the reliability of the scale (Nunnally & Bernstein, 1994); average variance extracted (AVE) is greater than 0.5, meaning the convergent validity of the construct is adequate (Fornell & Larcker, 1981); maximum shared variance (MSV) are smaller than AVE and square root of AVE (SQRTAVE) values are greater than inter-construct correlations, which shows that the discriminant validity of the construct is adequate (Rönkkö & Cho, 2022).

Table 5. Model validity test results

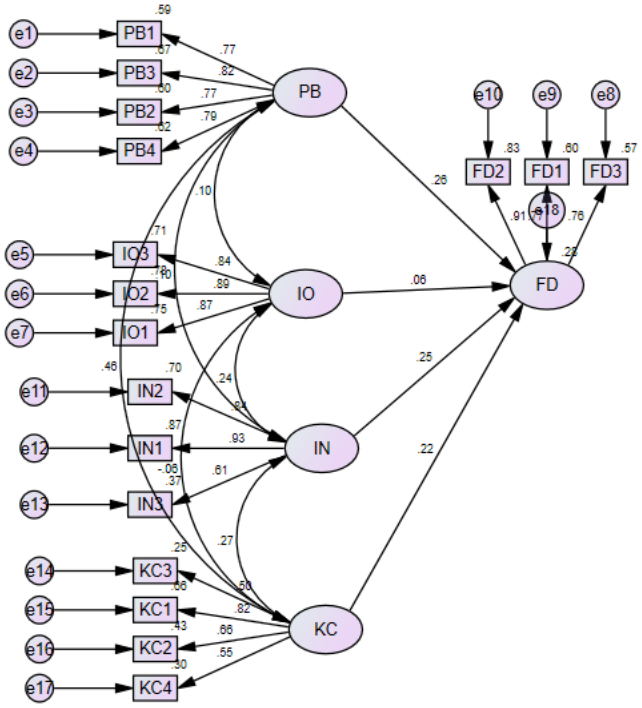
	CR	*AVE*	*MSV*	*MaxR (H)*	*SQRTAVE*	*PB*	*KC*	*IN*	*IO*	*FD*
PB	0.855	0.597	0.399	0.867	0.773	**0.773**				
KC	0.858	0.603	0.471	0.867	0.777	0.615***	**0.777**			
IN	0.902	0.754	0.253	0.915	0.868	0.345***	0.503***	**0.868**		
IO	0.869	0.689	0.194	0.871	0.83	0.363***	0.410***	0.440***	**0.830**	
FD	0.822	0.607	0.471	0.832	0.779	0.632***	0.686***	0.499***	0.340***	**0.779**

*Note: *** denotes 1% of significance.*

4.6. Results

Figure 4 represents result of SEM in normalized form which is employed to assess the interrelationship between PB, KC, IN, IO and FD with result as follows: x^2 = 241.854; df = 109; p = 0,000; Chi-square / df = 2.219 (between 1 and 3) (Seiler et al., 2010); CFI = 0.925 > 0.9, GFI = 0.888 (> 0.8) and RMSEA = 0.075 < 0.08.

Figure 4. Structural model analysis



Note: Chi-square = 241.854; df = 109; p = 0.000; Chi-square / df = 2.219; GFI = 0.888; TLI = 0.906; CFI = 0.925; RMSEA = 0.075.

Therefore, the model is suitable and qualified to use SEM analysis. Moreover, with the data set collected from the survey on FD for renewable energy of investment organizations in Vietnam and the factors affecting the decision, the research model is expected to be built from the overview and appropriate theoretical basis and the relationship between the scales ensures statistical significance.

Table 6. Results of the SEM analysis

Parameter	*Estimate*	*S. E.*	*C. R.*	*p-value*
FD ← PB	0.189	0.063	3.015	0.003
FD ← IO	0.062	0.079	0.790	0.429
FD ← IN	0.186	0.057	3.263	0.001
FD ← KC	0.307	0.138	2.226	0.026

The outcome reveals the significant impact of PB, KC and IN on FD. A PB in the effectiveness of the current policy to support renewable power development and belief in the efficiency of renewable energy technology has a positive impact on the FD of the organization with the coefficient $\beta = 0.189$ and p-value < 0.01, so hypothesis *H1* is supported. This result is similar to the results of Masini and Menichetti (2012), Amran et al. (2020), and Giang (2022). The result indicates that institutional investors in Vietnam are more willing to make investment decisions and pour capital into renewable energy projects when they have strong confidence and beliefs on the effectiveness of current renewable energy development support mechanisms and policies as well as confidence in the economic viability of renewable energy projects.

The result shows a significant, positive effect of knowledge of the operating context of renewable power projects on FD of organizations with the coefficient $\beta = 0.307$ and p-value > 0.01, so hypothesis *H2* is supported. Knowledge of the operating context of a renewable power project is the factor that has the strongest impact on an organization's FD. This implies that investors should take into consideration on operating context of renewable energy projects.

Normative institutional pressure has a positive impact on the organization's decision to finance wind power projects with the coefficient $\beta = 0.186$ and p-value < 0.05, so hypothesis *H3* is accepted. This result implies that with the source of information, the normative knowledge about knowledge in specialized projects such as wind power projects and the support from technical reports will help banks, investment organizations and individual investors have multiple sources of information to evaluate projects and make funding decisions by reducing the risks of investing in projects as well as storing information to improve their knowledge of project appraisal. Renewable energy projects serve as a premise for the organization's future investment and financing of renewable energy projects. This situation is completely in line with the practice in the Vietnamese market. When the renewable energy industry is still a young market, financial institutions such as banks do not have much experience and knowledge in lending to green energy projects such as solar power or wind power, along with apprehension about the risks that these projects bring, organizations are still very restrained in funding wind power projects. Therefore, good quality reference information from consultants or technical reports will be a quality reference source to support investment organizations in making FD for renewable energy projects.

Coercive institutional pressure has a negative impact on the organization's capital FD with the coefficient $\beta = 0.062$ and p-value > 0.05, so hypothesis *H4* is not statistically significant and hypothesis research is not accepted.

Table 7. Bootstrap results

Parameter	*S.E.*	*S.E.-S.E.*	*Mean*	*Bias*	*S.E. bias*	*Critical ratios*
FD ← PB	0.085	0.004	0.253	-0.005	0.006	-0.83
FD ← KC	0.088	0.004	0.213	-0.002	0.006	-0.33
FD ← IN	0.085	0.004	0.244	-0.008	0.006	-1.33
FD ← IO	0.090	0.004	0.057	-0.001	0.006	-0.16

The critical rate for standard errors of bias is used as the only number of estimates regarding to interrelationship between trust, operational prior knowledge, and normative application for project FD. The result of critical ratios in Table 7 is less than 1.96 (Chernick, 2008), so we can reject the null hypothesis that zero bias means that statistics and conclusions are quantified in the model with three variables namely a PB, KC and standard pressure that is reliable.

5. CONCLUSION

This study aims to estimate the determinants of FD for renewable energy projects in Vietnam such as PB, KC, IN, and IO. Previous studies have also documented how individuals use their PB to form opinions about investing in renewable energy and use different sources of information to rationalize these views (Woods, 2003; Haggett & Toke, 2006; Szarka, 2004). In addition, institutional pressure from normative sources impacts positively, and significantly on FD. Normative isomorphism is determined by the sources of information that investors use to make decisions. The effect of institutional isomorphism is even more significant in the context of incomplete information because when decision-makers lack the knowledge necessary to make objective judgments about investment or use complex technological options, they will consult experts and recognized authorities to reach their conclusions. According to Masini and Menichetti (2013), investment decisions are strongly influenced by the knowledge of the investors about renewable energy's operational context. At the same time, the study also shows that investors with greater knowledge of the renewable energy sector are more likely to go against the conventional wisdom and invest in risky renewable energy projects

Previous studies have highlighted the effect that coercion exerts on the organizations' behaviour through regulatory control and financial regulations of central banks (Hoque et al., 1994). Banks are required to operate in accordance with central bank regulations, such as privacy regulations and the Basel Accords. However, the updated Basel Accord III is likely to increase the cost of long-term financing, which will eventually affect the funding of capital-intensive renewable energy technologies such as wind power due to its reliance on long-term financing. In addition, the strict requirements of Basel III related to capital and liquidity could limit the number of banks' available sources of funds to finance renewable energy in the future. Moreover, the requirements of Basel III on the minimum capital adequacy ratio that banks must maintain are also the limitations to long-term capital sources to invest in capital-intensive projects such as renewable energy.

Currently, although Vietnam has a favourable natural potential for renewable energy, investors are

still hesitant to finance this energy sector due to concerns about the efficiency of renewable energy, policy, land use, grid connection, and access to new technology. At the same time, the investors' low levels of knowledge about the technique and operation of the energy systems have become a barrier to the development of renewable energy in Vietnam. Therefore, to attract capital, Vietnam needs to ensure stable and complete policy schemes as well as up-to-date research and development technology. The Vietnamese government needs to focus on promoting the development of the transmission grid, encouraging businesses to actively mobilize capital to invest in the development of the transmission grid. To ensure that the development of renewable energy projects meets the standards, units (not only officials operating in the field of wind power but also public agencies) need to be trained and improve expertise in the field of wind power, especially knowledge of environmental impacts, impacts on the power grid, safety and security requirements and other requirements. Improving renewable energy expertise and knowledge is crucial for investors to make financing policy decisions. Moreover, improving knowledge of the operating context should also apply to people in the area. Proposals for renewable energy projects are often opposed by people and some social organizations. Public outcry occurs for a number of reasons, such as environmental degradation, landscape impact, and lack of interest in consultation among local communities. The result of this study implies that future research should develop models with financial and non-financial indicators and enable government policy to lose credit lending policies in Vietnamese commercial banks.

The study focuses on institutional investors in Vietnam, which may limit the generalizability of its findings to other countries with different regulatory environments or market conditions.

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APPENDIX. QUESTIONNAIRE

RESEARCH ON THE FACTORS AFFECTING FINANCING DECISIONS FOR RENEWABLE ENERGY PROJECTS OF INSTITUTIONAL INVESTORS IN VIETNAM

Dear valued respondent, we are the scientific research group from the National Economics University (NEU) conducting a survey about the possible factors affecting investors' decisions on financing renewable energy projects in Vietnam.

Financing for renewable energy in Vietnam will benefit investors, commercial banks, and the whole society — for investors, credit extension helps accelerate project execution and profit earned from selling products to Vietnam Electricity (EVN). For banks, financing renewable energy power helps diversify investment portfolios. Finally, for society, funding for renewable energy power projects increases the power supply, ensures national energy security, and protects the environment.

This survey aims to identify factors affecting the funding decision of current renewable energy projects, which will then inform decisions for funding and development of future renewable energy projects.

All data gathered will be used for research purposes only and kept completely confidential. Thank you in advance for your time.

PART I: GENERAL INFORMATION

1. You are currently working at:
   - Venture capital funds, private equity funds, and hybrid funds
   - Banks
   - Mutual funds, pension funds, and insurance companies
   - Infrastructure development investment institutions
   - Private enterprises
2. Has your institution financed renewable energy projects before?
   - Yes
   - No
3. Experience of the institution in renewable energy investment:
   - Have no experience
   - Less than 5 years
   - From 5–10 years
   - More than 10 years
4. Share of renewable energy investments in the institution's portfolio:
   - Less than 5%
   - From 5%–9%
   - From 10%–49%
   - From 50%–99%
   - Only invest in renewable energy

PART II. DETERMINANTS OF FINANCING DECISION FOR RENEWABLE ENERGY

Please let us know what you think about the statements below. For each statement, you must specify your level of agreement to the statement typically in five points: 1) Strongly disagree; 2) Disagree; 3) Neither agree nor disagree; 4) Agree; 5) Strongly agree.

1. Market forces alone will never lead to significant exploitation of renewable energy.
2. The electricity price mechanism attracts capital investment in renewable energy.
3. Preferential policies on land and infrastructure promote investment decisions in renewable energy power projects.
4. Financial guarantees for renewable energy investments encourage institutional investment decisions.
5. The high cost of renewable energy technology has a negative impact on the investment decisions of the institution.
6. Long payback period of renewable energy projects has a negative impact on the investment decisions of the institution.
7. Lending policy for renewable energy projects is a barrier to renewable energy investment decisions.
8. The liquidity requirements in banks reduce the amount of investment capital for renewable energy projects.
9. The renewable energy investment trend of reputable enterprises in the same industry is the basis for the investment decisions of the institution.
10. Profits from renewable energy investments of reputable enterprises in the same industry are the basis for the investment decisions of the institution.
11. Information from the internal project appraisal department is the basis for institutions to make financing decisions for renewable energy power projects.
12. Information from technical reports on the renewable energy sector influences the investment decisions of institutions.
13. Advanced bladeless turbine technology will attract capital investment in renewable energy power projects.
14. Technological uncertainty is a barrier to institutional investment decision-making.