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SUSTAINABLE HOUSING DEVELOPMENT IN CHINA: DOES FINANCIAL INSTITUTIONS OVERCOME THE RISKS AND CHALLENGES TO SUSTAINABLE HOUSING?

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Abstract. Housing industry is one of the major threats to global environment and resource depletion. Particularly in China, it is regarded as a major challenge due to massive population growth. The most common barriers involve; economic barriers and environmental barriers. Therefore, to promote sustainable housing development, the management of these barriers is most crucial. This study is an attempt to overcome these barriers with the help of financial institutions in the context of China. The sample of the study are construction sector employees which are selected through simple random sampling method. Partial Least Square (PLS) is employed as statistical tool to analyze the primary data. Results revealed the positive role of financial institutions to overcome the challenges related to the economic barriers and environmental barriers. Financing from banks for the sustainable housing schemes can reduce the economic barriers and help to fulfil the sustainable housing criteria. Similarly, the environment requirements can also be achieved through environmental policy developed by the banks in China. This study recommended the Chinese government to promote sustainable hosing development through the promotion of bank financing and implementation of banks environmental policies.

Keywords: sustainable housing development, financial institutions, environmental policy, bank financing, economic barriers, environmental barrier.

JEL Classification: Q01, G23, Q56, Q54, Q56.

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1. Introduction

Housing is one of the main emphases that require exigent policies for sustainable development (Adabre et al., 2022). Unsatisfactory policies for sustainable housing have major effect to promote various problem in the society. Generally, it increases the issues in the society such as environmental issues, economic issues and social issues. To overcome these issues, important measures are needed to initial globally. Particularly, the sustainable housing development is most important among the highly populated nations. Chin is one of the countries having huge population, therefore, sustainable housing development is a challenge for Chinese government.

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The increasing population of China require wide housing schemes and planning to overcome various issues related to the sustainable housing development. The extensive population of China is a major reason which limit the sustainable development in housing. China has taken various measures at national level to overcome various challenges of sustainable housing (Ahmed et al., 2020), but the problem is still needed to address. To fulfill the growing needs of population, the promotion of sustainable housing is required through different strategies. The crucial challenges facing by the sustainable housing is based on the economic requirements and environmental requirements (Adabre et al., 2022; Hasanov et al., 2019). The economic challenge includes the insufficient funding for the sustainable housing projects. Government is not providing the sufficient funds to the development of sustainable houses. Lack of financial resources could not meet the requirement of extensive population. The sustainable building materials cost is another important barrier which decreases the sustainable housing performance. Thus, the growing cost of sustainable material decreases the efficiency of sustainable projects. Therefore, along with the other issues, the fulfillment of economic requirement is most crucial (Adabre et al., 2022). The second most crucial challenge is the fulfillment of environmental requirement (Susilo & Octarino, 2022). The material used for the construction has significant effect on the environment (Dawoud et al., 2020; Shurrab et al., 2019). The use of sustainable material with no harm to the environment is important which a challenge is. The availability of appropriate land within the cities is another issue connected with the environmental requirements. Hence, the fulfillment of sustainable housing criteria's is connected with the economic and environmental barriers.

This study attempted to promote the solution of economic and environmental challenges through financial institutions which can help to fulfil sustainable housing criteria. Financial institutions such as bank can minimize the problem of economic issues. Economic requirement can be fulfilled through financing from banks. The support of banks to meet the financial requirements is important to promote sustainable housing projects. Banks can support various bodies to purchase sustainable construction material through green financing (Wang et al., 2021). Furthermore, environmental requirements can also be fulfilled through banks environmental policies (Wang et al., 2021). Most of the banks provide green financing Zhang et al. (2022) based on the environmental concern and to fulfil their social responsibilities. The purpose of the financial institutions to protect environment can be well managed through green financing. While maintaining the environmental policies, banks provide loan for the green projects. Similarly, sustainable housing also focusses on environmentally friendly housing projects. Therefore, both the issues of economic requirements and environmental requirement can be managed through financing institutions. Hence, according to this study, financial institutions such as banks can help to fulfil economic and environmental requirements which can fulfill the criteria of sustainable housing.

Results on the study would enable policymakers to re-evaluate different barriers to sustainable housing development, and it could serve in decision making process for refining housing provision from the formal sector of the housing market in China as well as in other countries. This study has valuable insights for policymakers because this study added value to the literature of sustainable housing development. By introducing the solution of economic and environmental problems, this study promotes the sustainable housing criteria which can

help the policymakers to resolve the growing problem of sustainable housing in China. This is the unique study which introduced bank financing to fulfill the economic requirements of sustainable housing. Furthermore, this study introduced financial institutions a way to fulfill the environmental requirements of sustainable housing. The valuable insights of this study are help for academicians as well as policymakers.

The study is comprised of five sections. Introduction part begins with extensive knowledge which establishes the argument regarding motivation and significance of the study. The next section sheds light on prior literature through which study's variables have been explained. The third section talks about methodology which covers sampling method, study population, adopted questionnaire and the data technique which have used in the study. The following section illustrates the result which are further compared to prior literature. Lastly, the conclusion of the study is made along with some implications, limitations and future directions.

2. Literature review

Increasing population in China require huge housing requirements. Sustainable housing is based on a well-framed housing policy that purposes to maintain sustainability in all angles such as environment, social as well as economic. Sustainable housing further denotes to construction, which is energy effective, comfortable for living, well-organized waste disposal system and alternative source of energy (Kumari, 2022; He et al., 2022). Chinese construction companies are working on number of projects, but this fulfilment of increasing population is more tough. As China is becoming more urbanized, about 3.5 million units of housing are built every year. Hence, it is very significant to develop sustainable housing (Chen et al., 2007). There are number of sustainable housing requirements which are required to fulfil by the construction industry. Timely completion of the project (Ogweno et al., 2016) and performance of the project in terms of cost are the important requirements of sustainable housing. Furthermore, quality performance along with the safe construction is the requirement of sustainable housing criteria. Additionally, eco-friendly construction (Pan et al., 2021) and ease of maintenance of housing facility. Additionally, technology transfer and energy efficient housing is key to the sustainable housing. But to fulfil the sustainable housing criteria, the number of challenges is needed to manage which are facing by the sustainable housing development companies. The most important challenges selected by the current study are economic requirements and environmental requirements. This study proposed that; bank financing and bank environmental policy can resolve these challenges. Figure 1 represented the challenges such as economic requirements and environmental requirements including the role of financial institutions through bank financing and bank environmental policy.

2.1. Bank financing

Bank financing is one of the most important and one of the major services of financial institutions (Antipin & Trufanova, 2021; Li et al., 2022; Zheng et al., 2021b). Bank accept deposits from the individuals and various organizations and lend these deposits on specific interest rates to various individuals and organizations. Therefore, bank financing is one of the im-

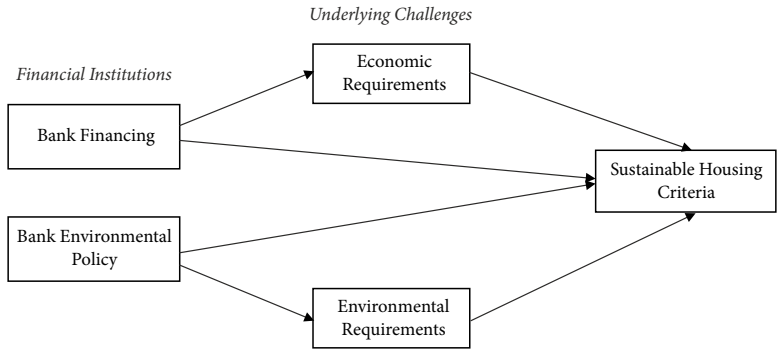

Figure 1. Study framework

portant tools for the business organizations to fulfill their capital requirements. Bank lend based on specific requirements to the organizations. The current study is related with the construction industry of China (Xu et al., 2019) and financial institutions like banks playing and important role to provide financing to construction industry of China. Banks provide loan to the construction industry based on various terms and conditions to help various construction projects. By taking loan from the banking industry, the construction companies manage capital requirements and achieve higher performance (Chan & Adabre, 2019).

2.2. Bank environmental policy

Along with the financing services of banks, these institutions are also managing the requirements of environment. Banks have their own environmental policy which help to maintain the health of the environment (Galletta et al., 2021; Khattak & Saiti, 2021). The environment policy of the banks is based on the financing to various projects which do not have negative effect on the environment. This policy is also connected with the social responsibility of these institutions. The environmental policy based on various strategies of banks are the promotion of environmental health. This policy of banks is based on the financing activities such as green financing (Rashid & Uddin, 2018). Green Finance is one of the common instruments nowadays to promote environmental performance. The projects of individuals as well as various organizations having positive effect on the environment are financing by the banking industry.

2.3. Economic requirements

The economic requirements are based on the financing needs of construction projects. Funding is most important to promote sustainable projects which is related to the major economic needs. Additionally, the inspection of the land is most important as confirmation of the land regarding living resources availability is important. Therefore, cost of serviced land is most important to consider while considering economic requirements. Additionally, the high cost of building materials as well as use of sustainable technology is important (Shi et al., 2014). The other requirements which make construction tough for companies is to meet the economic requirements based on the high taxes as well as fees along with the inflation rate. All these economic requirements are the major challenge for the construction companies working in

China (Adabre & Chan, 2019). The promotion of sustainable housing development is majorly linked with these economic requirements in China.

However, economics requirements can be fulfilled with the help of bank financing. The high cost of funding to the sustainable construction projects can be resolved through financing from financial institution such as banks. As reported in the previous studies that credit is one of the helpful tool to raise finance for construction projects. The cost of inspection of the land can be managed from financial institutions. The requirement of the high cost of materials and sustainable technology requirements for the sustainable housing can be fulfilled by getting credit from the financial institutions. The fulfillment of economic requirements with the help of bank finance can also achieve sustainable housing criteria. The management of economic requirements can lead to the management of sustainable development criterions. Therefore, bank financing has direct effect on sustainable requirements and it also has significant effect to promote sustainable development criterions. Similarly, previous studies identified the significant role of financial institutions in sustainable development (García-Sánchez et al., 2020). The promotion of bank financing in China can promote the management of economic requirements of construction projects and sustainable development criteria achievement.

H1. *Bank financing has significant relationship with economic requirements.*

H2. *Bank financing has significant relationship with sustainable housing criteria.*

2.4. Environmental requirements

Environment always remain on the priority for the nations (Wu et al., 2020). Similarly, the environment health is on priority for Chinese government and various projects on construction have certain requirements related to protect the environment performance. The companies working in China is needed to follow various rules and regulations related to the environmental requirements. All the activities related to the construction projects having negative effect on the environment are prohibited in China. Therefore, resources as well as land within the city is needed and the companies must ensure that the construction will not harm the environment.

The fulfillment of environmental rules and regulations is most important for businesses. Because business activities have significant negative impact on the environmental performance (Chuang & Huang, 2018), therefore, the government of various nations developed different rules to carry out business activities. Similarly, the banks have their own environmental policy to protect the environment. The environmental requirements of construction projects can be improved with the help of bank environmental policies. The bank environmental policies could be followed to improve the sustainable construction project by fulfilling the environmental requirements. The financial institutions environmental policy (Richardson, 2002) help to use various technologies as well as material which help out to enhance environmental performance. Most importantly the green financing activities of the financial institutions help to invest in various green projects (Chen et al., 2022; Zhang et al., 2022). The green financing from banks helps the construction companies to use the technology which is environmentally friendly. Furthermore, green financing also helps to purchase materials which have no or

negligible effect on the environment. It is highlighted in other studies that green financing has significant positive role to protect the environment (Chen et al., 2022; Wu et al., 2020; Zhang et al., 2022). Bank environmental policy has positive role to promote environment requirements with the help of green financing and it is also leading to achieve sustainable development criterions in construction projects.

H3. *Bank environmental policy has significant relationship with economic requirements.*

H4. *Bank environmental policy has significant relationship with sustainable housing criteria.*

Aforementioned discussion also highlighted the significant effect of economic requirements on sustainable housing criteria. Similarly, environmental requirements have significant effect on sustainable housing criteria. Thus, this study proposed the direct effect of economic requirements and environmental requirements on sustainable housing criteria. From the literature, the mediating role of economic requirements and environmental requirements is identified (Ibrahim, 2020; Safronova et al., 2017). Hence, following direct and indirect effects are proposed;

H5. *Economic requirements have significant relationship with sustainable housing criteria.*

H6. *Environmental requirements have significant relationship with sustainable housing criteria.*

H7. *Economic requirements mediate the relationship between bank financing sustainable housing criteria.*

H8. *Environmental requirements mediate the relationship between bank financing sustainable housing criteria.*

3. Methodology

3.1. Research design

This study addressed the effect of bank financing on economic requirement and sustainable housing criteria. The effect of environmental policy is considered on environmental requirements and sustainable housing criteria. The nature of all the variables and relationship is supported for primary data. Therefore, this study preferred primary data to achieve empirical results by following the cross-sectional research design. While using cross-sectional research design, quantitative method is deployed. Accordingly, this study designed a questionnaire to collect data from the respondents.

3.2. Measures of the variables

This study measured five variables; bank financing, environmental policy, economic requirements, environmental requirements and sustainable housing criteria. All these variables are measured by adapting the already revealed questionnaire items in the previous studies. Five questionnaire items were adapted from Erdogan (2016). In the questionnaire, various questions were asked that whether the respondent has received the financing from banks for construction in past. Bank environmental policy is considered by adapting different questionnaire items related to the green financing. Green financing of the various ecofriendly projects

is focused in the questionnaire. The questionnaire for bank environmental policy is adapted from Chen et al. (2022). Furthermore, questionnaire for economic challenges, environmental challenges and sustainable housing criteria is adapted from Adabre et al. (2022). Economic challenges are preferred by considering the inadequate public funding, excessive cost of serviced land, excessive cost of sustainable building materials/technologies, high approval cost due to high taxes, fees on developers and high inflation rates. Environmental challenges are considered through inadequate access to land within cities/towns, environmental effect of housing projects/facilities and low-rise housing development. Low-rise development of residential facilities could lead to faster depletion of land resources. The sustainable housing criteria is measured through timely completion of project, quality performance, safety performance, environmental-friendly (eco-friendly), energy efficient housing, affordable price of facility and technology transfer/innovation. The questionnaire of the current study is attached in Appendix.

3.3. Sampling procedure and response rate

This study selected the sample size by following the previous studies in the field of sustainable housing development. Most of the studies selected 300 sample size which is considered as accurate. However, China has huge population and comprised of large area, therefore, this study considered 500 sample size. Statistics provided by previous studies also considered 500 sample size as good. Therefore, 500 questionnaires were used in the survey and distributed among the Chinese construction companies. The employees working in Chinese construction companies were selected as the respondents of the current study. Simple random sampling is used in this study in which participants are randomly selected from a given population. Data collection is made through self-administered questionnaire and email survey. 230 questionnaires were received from the survey. 10 questionnaires were not completed by the respondents. Therefore, total 220 responses were used for data analysis. Response rate of valid responses was 44% which is appropriate to proceed the analysis. The response rate is provided in Table 1.

Table 1. Response rate

Response	Frequency/Rate
Distributed Questionnaires	500
Returned Questionnaires	230
Useable Questionnaires	220
Excluded Questionnaires	10
Total response rate after data entry	44%

4. Data analysis

Previous studies recommended to examine the quality of the questionnaire and data collected through questionnaire (Ekasari et al., 2019; Hair Jr et al., 2014). Therefore, this study examined the reliability and validity of the questionnaire by using Partial Least Square (PLS).

Previous studies recommended various criteria's such as factor loadings, Cronbach alpha, composite reliability, convergent validity and discriminant validity. To address the reliability of the questionnaire, factor loadings, Cronbach alpha and composite reliability is preferred. The loading of each scale item must not be less than 0.7 (Hair Jr et al., 2021). All the factor loadings are given Appendix (Table A1). It is found that all the scale items have minimum factor loading not less than 0.7. The minimum value of Cronbach alpha and composite reliability must not be less than 0.7 (Henseler et al., 2014). These values are given in Table 2. Bank financing has Cronbach alpha and composite reliability 0.859 and 0.866, environmental policy has Cronbach alpha and composite reliability 0.817 and 0.837, economic requirements have Cronbach alpha and composite reliability 0.759 and 0.867, environmental requirements have Cronbach alpha and composite reliability 0.884 and 0.828 and sustainable housing criteria has Cronbach alpha and composite reliability 0.795 and 0.86, respectively.

To address the convergent validity, two criteria are important which include; composite reliability and average variance extracted (AVE). Convergent validity is the quality criteria which considered the correlation between scale items of a same variable (Cheah et al., 2018). According to previous studies on statistical data analysis, the minimum value of AVE should be higher than 0.5. For convergent validity achievement, the value of composite reliability and AVE should not be less than 0.7 and 0.5, respectively. The first measure of convergent validity is composite reliability which is higher than 0.7 for bank financing, environmental policy, economic requirements, environmental requirements and sustainable housing criteria as given in Table 2.

The second measure of convergent validity is given in Figure 2 which is higher than 0.5. The accurate values of AVE are also highlighted in Table 2. Furthermore, discriminant validity considers the correlation between scale items of different variables. There must be no correlation between scale items of different variables. The discriminant validity is measured by using the AVE values of all the variables. Fornell-Larcker criterion is employed to examine discriminant validity as shown in Table 3 (Hilkenmeier et al., 2020).

This study examined path coefficient to check the relationship between bank financing, environmental policy, economic requirements, environmental requirements and sustainable housing criteria. While considering the path coefficient, t-statistics and p-statistics are observed. To accept the hypotheses, p-statistics must be less than 0.05 and t-statistics must be higher than 1.96. Eight hypotheses are proposed in this study including two mediation effect hypotheses. The path coefficient results of direct hypotheses are reported in Table 4.

Table 2. Quality criteria including the reliability and validity

Variables	α	Composite reliability (rho_a)	Composite reliability (rho_c)	(AVE)
Bank Environmental Policy	0.817	0.729	0.837	0.749
Bank Financing	0.859	0.86	0.866	0.704
Economic Requirements	0.759	0.859	0.867	0.83
Environmental Requirements	0.884	0.884	0.828	0.812
Sustainable Housing Criteria	0.795	0.85	0.86	0.781

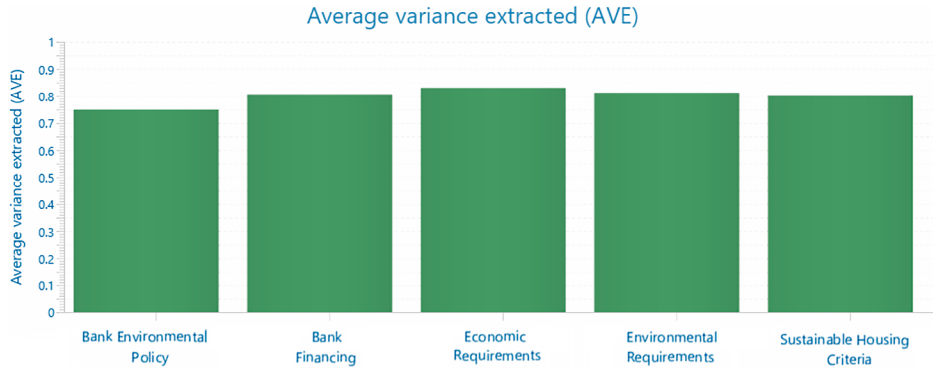

Figure 2. Average Variance Extracted (AVE) histogram

Table 3. Fornell-Larcker

Variables	Bank Environmental Policy	Bank Financing	Economic Requirements	Environmental Requirements	Sustainable Housing Criteria
Bank Environmental Policy	0.866				
Bank Financing	0.722	0.897			
Economic Requirements	0.767	0.683	0.911		
Environmental Requirements	0.743	0.645	0.812	0.901	
Sustainable Housing Criteria	0.763	0.66	0.736	0.699	0.795

Table 4. Path coefficient results

Relationship	β	(STDEV)	T Value (|O/STDEV|)	P values
Bank Environmental Policy -> Environmental Requirements	0.743	0.026	28.918	0
Bank Environmental Policy -> Sustainable Housing Criteria	0.193	0.064	3.006	0.003
Bank Financing -> Economic Requirements	0.683	0.036	18.956	0
Bank Financing -> Sustainable Housing Criteria	0.115	0.05	2.302	0.022
Economic Requirements -> Sustainable Housing Criteria	0.649	0.067	9.715	0
Environmental Requirements -> Sustainable Housing Criteria	0.239	0.066	3.633	0

All the hypotheses are supported because the t-statistics are more than 1.96 and p-statistics are less than 0.05. Hypotheses 1 showing the relationship between bank financing and sustainable housing criteria. The t-value of this relationship is 2.302 which shows the significant relationship. Hypotheses 2 shows the relationship between bank financing and economic requirements. The effect of bank financing on economic requirement found t-value 18.956.

Furthermore, hypotheses 3 and hypotheses 4 highlighted the effect of environmental policy on sustainable housing criteria and environmental requirements, respectively. There is a significant relationship between environmental policy and sustainable housing criteria with t-value 3.006. Environmental policy has significant effect on environmental requirement with t-value 28.918. Furthermore, economic requirements have positive effect on sustainable housing criteria with t-value 9.715. Finally, while examining the direct effect of environmental requirements on sustainable housing criteria, t-value found 3.633 which is significant. Therefore, hypothesis 5 and hypothesis 6 are significant. Path coefficient results are presented in Table 4.

The same criteria of t-statistics and p-statistics are observed to test the mediation effect. Two mediation effects are considered which are based on two hypotheses. The mediation effect of economic requirements is considered between bank financing and sustainable housing criteria which is represented in hypotheses 7. Hypotheses 8 represent the mediation effect of environmental requirements between bank financing and sustainable housing criteria. Path coefficient results for mediation effect are shown in Table 5. According to the statistical results, mediation effect of economic requirements is considered between bank financing and sustainable housing criteria which is significant because the t-value 8.563 is higher than the minimum threshold level. Furthermore, the mediation effect of environmental requirements between bank financing and sustainable housing criteria is also significant with t-value 3.609. The path coefficient histogram for the mediation effect of economic requirements between bank financing and sustainable housing criteria is shown in Figure 3. Additionally, the path coefficient histogram for the mediation effect of environmental requirements between environmental policy and sustainable housing criteria is shown in Figure 4.

5. Discussion

Findings of the study provided important insights which can help to promote sustainable housing development in China through the fulfilment of various sustainable housing criteria. Findings of the study reported that bank financing has positive role to enhance sustainable housing criteria. The hurdles faced by the sustainable development such as financing hurdles can be managed through bank financing. As financing from banks is helpful in construction industry. Findings shows that the increase in financing from banks can increase the fulfilment of sustainable housing criteria. Furthermore, the environmental policy is also helpful to fulfill various criteria of sustainable housing. More construction can decrease the environmental performance, therefore, the environmental policy adopted by the banks can enhance the sustainability in construction industry which can help to enhance environmental health solutions. Therefore, financial institutions services such as bank financing and environmental policy of banks can encourage sustainable housing criteria. Previous studies also mentioned that financial institutions can promote sustainable development with the help of various services (Khatib et al., 2021).

According to the findings of the current study, the first service of financial institutions; bank financing can help to reduce economic challenges. The economic challenges in the way of sustainable housing development can be fulfilled with the help of financing from banks. Banks provide loan to the individuals as well as construction companies to promote sustainable development in construction. Sustainable development always require huge financial

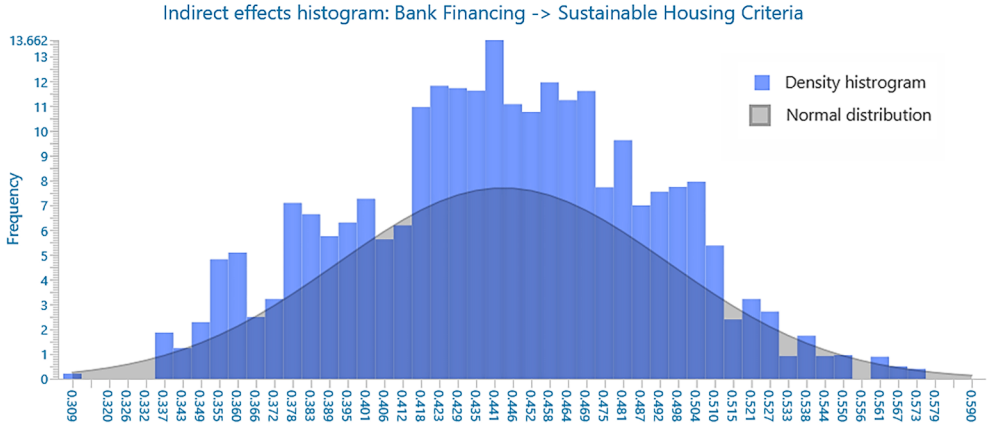

Figure 3. Path coefficient histogram (mediation of economic requirements between bank financing and sustainable housing criteria)

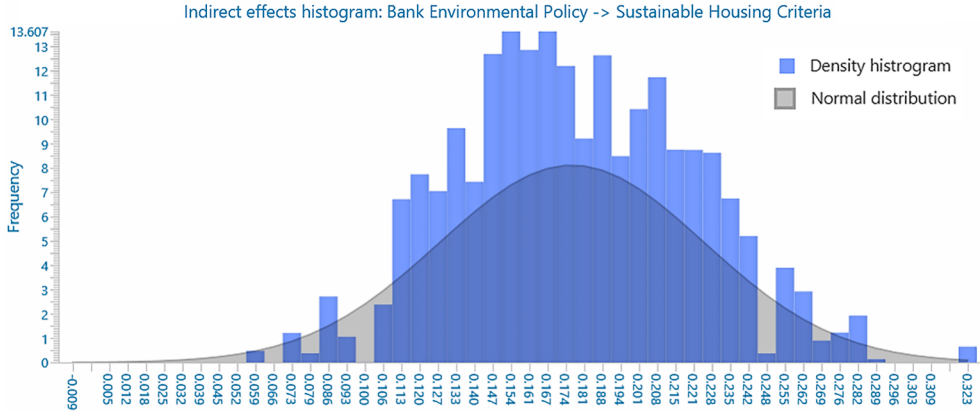

Figure 4. Path coefficient histogram (mediation of environmental requirements between bank environmental policy and sustainable housing criteria)

resources (Kedir et al., 2017) which can be achieved through bank financing as proved by the findings of the study. Therefore, findings of the study proved the more availability of bank financing in China can help to manage the economic problem. Furthermore, environmental issues are most common which are connected with the construction industry. These issues can also be managed through banks which is proved by the current study. The green financing activities carried out by the banks are eco-friendly (Zhang et al., 2022; Zheng et al., 2021a). Most of the banks has their own environmental policy which help them to separate the funds to support green projects such as sustainable housing schemes. The implementation of banks environmental policies in China has decrease the environmental issues related to the construction industry.

Furthermore, findings of the study indicated the positive role of the fulfilment of economic requirement on sustainable housing development. It is proved that the managed of economic requirements through bank financing can help to fulfil sustainable housing criteria.

Economic requirements can promote sustainable housing criteria through bank financing. Increase the achievement of economic reequipments through green financing can increase the sustainable housing criteria. Thus, economic reequipments has direct as well as indirect effect to improve sustainable housing criteria. Additionally, findings of the study indicated the positive role of the fulfilment of environmental requirement on sustainable housing development. Similar with the economic requirements, environmental requirements also have direct and indirect effect on sustainable housing criteria. Increase in the fulfillment of environmental requirements for the sustainable housing can increase the management of sustainable housing criteria. According to the findings, environmental requirements help to create a link between bank environmental policy and sustainable housing. The positive role of bank environmental policy on environmental requirement of the sustainable housing help to promote sustainable housing development in China. Thus, both the services of financial institutions; economic requirements and environmental requirements has positive effect to promote sustainable housing development.

6. Conclusions

Challenges facing by the Chinese construction industry in sustainable housing development can be settled through different strategies related to the financing and environmental policies. Two challenges; economic requirements and environmental requirements can be well managed with the help of financial institutions such as banks. The financing requirements of sustainable housing development can be well managed with banking industry in China. The opportunity of loaning from banks help to solve economic requirements. Furthermore, the environmental policies of banks may help the construction industry of China to fulfil the environmental requirements. The solution of economic requirements and environmental requirements can help to fulfil sustainable housing criteria.

This study externed the body of knowledge by contributing through several perspectives. This study introduced the solution of various challenges in the construction industry of China. Particularly, sustainable housing development is considered in this study by addressing various challenges faced by the construction industry of China in the way of sustainable housing development. Therefore, this study highlighted the important challenges facing by the construction sector of China. Two important challenges; economic requirements and environmental requirements is mentioned in previous studies, but the solution of these challenges was not addressed by the literature. This study added valuable literature by proving that financial institutions are most important to manage these challenges. This study highlighted that bank financing can managed economic requirements. Economic requirements addressed in other studies have not highlighted banks as major source to solve the problem of economic requirements. Additionally, this study also highlighted another contribution by addressing the issues of environmental health related to the sustainable housing development. Similar with the economic requirements, this study addressed that environmental challenges can also be managed through financial institutions. The implementation of banks environmental policy can help to manage environmental requirements proposed by various environmental protection organizations. Thus, this study extended the literature by highlighting the most

significant relationship between financial institutions, economic requirements and environmental requirements in relation to sustainable housing development.

Practically, this study provided important understandings for the policymakers to address sustainable housing development in a better way. Findings of the study can help different organizations to enhance sustainable housing in China. Even this study is helpful for the organizations working in various other countries to enhance sustainable development through the valuable findings reported by the current study. Not only the construction related organizations, but the organizations working on environmental protection may also get valuable insights form this study while making different strategies to promote environmental health. With the help of this study, construction companies working in China should promote sustainable housing by focusing on the opportunities available at financial institutions. It is recommended to the construction industry, the financing from the banks should be encouraged to solve the issues of economic requirements. Furthermore, these companies should fulfil environmental requirements by focusing on the green financing opportunities provided by the banks. The environmental policies developed by the banks must be followed by the construction industry of China to fulfil environmental requirements. Hence, results of this study provided insights for the policymakers to managed different challenges in the way of sustainable housing.

Since several issues are associated with sustainable rates. Thereby, we can say that price material is the one to consider most because sustainable price material cost is higher than traditional material cost. However, the barrier can be removed when bank financing policies are sound and easier to be accessed by netizens. There should also be a consideration that sustainable housing starts with less supply costs. Thus, a remarkable design management is crucial for sustainable housing development so that cost may not vary in higher ranges. Creation of an optimal building with less energy consumption and environmentally friendly demands a complex optimization which further is equipped with integrated planning procedure. However, government institutions are need to back it with through financial leverages which is only possible when sustainable housing schemes are promoted at national level. Local government should also make policies and program to promote sustainable and affordable housing. These programs should include green building practices and focus on energy-efficient designs to encourage sustainable housing development. Moreover, there should be a partnership between public sector and private sector because this way affordable and sustainable housing growth can be fostered. A collaboration between financial institutions, real state and government agencies must be made to channelize the investment towards sustainable housing projects. These collaborations should promote knowledge sharing and capacity building attributes that ensure successful sustainable housing with affordable price points. In addition to this, sustainable housing development should be encouraged through financial incentives. Government should take initiatives to offer sustainable and affordable housing scheme to all citizen and highlight the distinct features such as environmentally friendly designs or energy-efficient features. This helps government to offer financial subsidies not only for developers but also homeowners who prefer adopting green practices. Lastly, innovative fundings options should be offered such as microfinance from banks because such as models provide promising completion of sustainable housing initiatives.

7. Recommendation for future studies

This study is limited to the two major challenges of sustainable housing development, however, there are several other challenges which may influence on the performance of sustainable housing development in China. Therefore, it is recommended to the future studies to consider various other challenges and recommend the solution of newly added challenges in the framework. The other important challenges may include; social challenges and institutional challenges. Moreover, this study considered bank financing and bank environmental policy as two variables. However, bank financing and banks environmental policy can be covered through green financing. Therefore, future studies may include green financing as one variable instead of using two variables; bank financing and bank environmental policy.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The author declare that they have no competing interests.

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APPENDIX

Table A1. Factor loadings

	Bank Environmental Policy	Bank Financing	Environmental Requirements	Economic Requirements	Sustainable Housing Criteria
BEP1	0.86				
BEP2	0.884				
BEP3	0.896				
BEP4	0.893				
BEP5	0.791				
BF1		0.866			
BF2		0.89			
BF3		0.899			
BF4		0.924			
BF5		0.92			
BF6		0.876			
BF7		0.899			
ENR1			0.886		
ENR2			0.91		
ENR3			0.907		
ER1				0.901	
ER2				0.913	
ER3				0.896	
ER4				0.898	
ER5				0.927	
ER6				0.931	
SHC1					0.864
SHC2					0.905
SHC3					0.87
SHC4					0.899
SHC5					0.912
SHC6					0.918

Questionnaire

Dear Respondent,

I am conducting research entitled "Sustainable Housing Development in China: Does Financial Institutions overcome the Underlying Challenges to Sustainable Housing?". The ultimate objective of the current study is to promote the solution of economic and environmental challenges through financial institutions which can help to fulfil sustainable housing criteria. Attached is a brief survey questionnaire that will take few minutes to complete. All information provided is strictly confidential and will only be used for research and academic purposes. Your cooperation and participation in this research are greatly appreciated. Every response given is important as it determines the success of this research. Thank you very much for your kind cooperation.

For each statement, please indicate the extent to which you agree or disagree with the statement by **ticking or circling** an appropriate number on the five-point scale provided. Please read the following statement and mark accordingly:

1 – Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree.

Sustainable Housing Criteria

1	SHC1	Timely completion of project is important to achieve	1	2	3	4	5
2	SHC2	Certain level of quality performance is important to achieve	1	2	3	4	5
3	SHC3	Environmental-friendly (eco-friendly) building and process is important to achieve	1	2	3	4	5
4	SHC4	Energy efficient housing is important to achieve	1	2	3	4	5
5	SHC5	Affordable price of facility is important to achieve	1	2	3	4	5
6	SHC6	Technology transfer/innovation is important to achieve	1	2	3	4	5

Bank Environmental Policy

7	BEP1	Increase in the amount invested on ecofriendly projects	1	2	3	4	5
8	BEP2	Investment of more resources on recycling and recyclable products	1	2	3	4	5
9	BEP3	Increase in investment on waste management and green brick manufacturing	1	2	3	4	5
10	BEP4	Increase in the amount invested on green construction industry development	1	2	3	4	5
11	BEP5	Increase in the amount invested on energy efficiency projects	1	2	3	4	5

Bank Financing

12	BF1	Our firm apply for a bank loan in the last three years.	1	2	3	4	5
13	BF2	Our firm demand for bank loans increases with lower interest rates.	1	2	3	4	5
14	BF3	Our firm demand for bank loans increases with lower collateral requirements.	1	2	3	4	5
15	BF4	Our firm demand for bank loans increases with lower interest rates.	1	2	3	4	5
16	BF5	Our firm demand for bank loans increases with lower collateral requirements.	1	2	3	4	5
17	BF6	Our firm in a position to apply for a bank loan when it is needed bank financing in the last three years with the idea that the application would not be rejected.	1	2	3	4	5
18	BF7	Our firm in a position to apply for a bank loan when it is needed bank financing in the last three years with the idea that the application would not be rejected.	1	2	3	4	5

Economic Requirements

19	ER1	Inadequate public funding is needed for sustainable projects.	1	2	3	4	5
20	ER2	Excessive cost of serviced land is high.	1	2	3	4	5
21	ER3	Excessive cost of sustainable building materials/technologies is high.	1	2	3	4	5
22	ER4	High approval cost is required due to high taxes and fees on developers	1	2	3	4	5
23	ER5	High interest rates increase the cost.	1	2	3	4	5
24	ER6	High inflation rates increase the cost.	1	2	3	4	5

Environmental Requirements

25	ENR1	The inadequate access to land within cities/towns is a problem.	1	2	3	4	5
26	ENR2	The requirement of peripheralization of housing projects/facilities is important.	1	2	3	4	5
27	ENR3	The requirement related to low-rise housing development is not easy to achieve.	1	2	3	4	5