

P-ISSN 2734-9748 • E-ISSN 2815-6471

VMOST Journal of Social Sciences and Humanities

APRIL 2023 • VOLUME 65 NUMBER 1



Vietnam Ministry of Science and Technology

The VMOST Journal of Social Sciences and Humanities (VMOST JOSSH) is the official tri-annual scientific title in English of Vietnam Ministry of Science and Technology. The VMOST JOSSH aims to become an international journal that meets the standards of the world's leading databases of scientific journals such as Scopus, Web of Science. The VMOST JOSSH mainly publishes original peer-reviewed articles and reviews in interdisciplinary and multidisciplinary fields of social sciences and humanities with the focus on:

- Vietnamese Studies
- Economics and Business
- History and Archaeology
- Educational Sciences
- Sociology, Anthropology, and Ethnology
- Linguistics and Literature
- Psychology
- Philosophy and Religion
- Jurisprudence
- Political Sciences

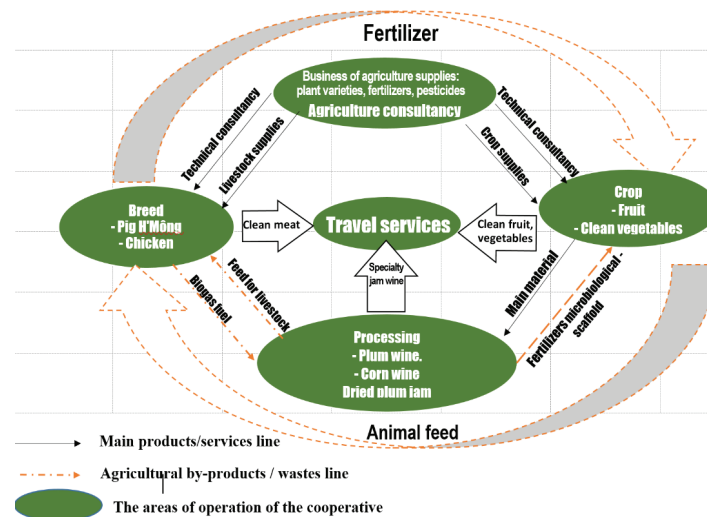
CLASSIFICATION SCHEME

Social Sciences

1. **Psychology**
 - 1.1. Developmental Psychology
 - 1.2. Counseling and Clinical Psychology
 - 1.3. Educational Psychology
 - 1.4. Other Psychology
2. **Economics and Business**
 - 2.1. Economics
 - 2.2. Business and Management
 - 2.3. Other Economics and Business
3. **Educational Sciences**
 - 3.1. Education Systems
 - 3.2. Curriculum and Pedagogy
 - 3.3. Specialist Studies in Education
 - 3.4. Other Education
4. **Sociology, Anthropology, and Ethnology**
 - 4.1. Sociology
 - 4.2. Anthropology
 - 4.3. Ethnology
 - 4.4. Other Sociology, Anthropology, and Ethnology
5. **Political Sciences**
 - 5.1. Political Science
 - 5.2. International Relations
 - 5.3. Other Political Science
6. **Jurisprudence**
7. **Other Social Sciences**

Humanities

8. **History and Archaeology**
 - 8.1. History
 - 8.2. Archaeology
 - 8.3. Other History and Archaeology
9. **Linguistics and Literature**
 - 9.1. Linguistics
 - 9.2. Literary Studies
 - 9.3. Cultural Studies
10. **Vietnamese Studies**
11. **Philosophy and Religion**
12. **Other Humanities**



PSYCHOLOGY

- 3** Mindsponge-based investigation into the non-linear effects of threat perception and trust on recycled water acceptance in Galicia and Murcia, Spain.

*Minh-Hoang Nguyen,
Thi-Phuong Nguyen,
Hong-Son Nguyen,
Viet-Phuong La,
Tam-Tri Le,
Phuong-Loan Nguyen,
Minh-Hieu Thi Nguyen,
Quan-Hoang Vuong*

ECONOMICS AND BUSINESS

- 11** Application of SEM in analysing the effect of competitiveness, operating effectiveness and risk management on

the stability of Vietnamese construction corporations.

*Thi Le Uyen Vo,
Thi Nga Nguyen*

- 24** Determining factors affecting innovation capacity of students at economic universities in Hanoi.

*Dieu Linh Ha,
Thi My Linh Nguyen,
Van Hoang Nguyen,
Gia Huy Tran,
Duc Kien Nguyen,
Khanh Huyen Trinh*

- 34** Factors affecting customers' satisfaction on mobile banking service quality at Asia Commercial Joint Stock Bank.

*Tran Minh Hieu,
Le Phuoc Huy*

- 41** Agricultural cooperatives and climate change adaptation - Case study in Son La, Vietnam.

*Thi Hai Vu,
Thi Diem Hong Phi,
Dang Hoc Nguyen,
Quang Trung Tran*

- 54** Behaviours of restaurants in a beef value chain in Dien Bien province.

*Bui Van Quang,
Nguyen Thi Duong Nga,
Pham Van Hung,
Duong Nam Ha,
Tran The Cuong,
Han Anh Tuan,
Le Thi Thanh Huyen,
Stephen Ives*

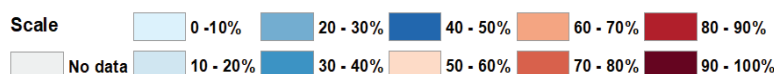
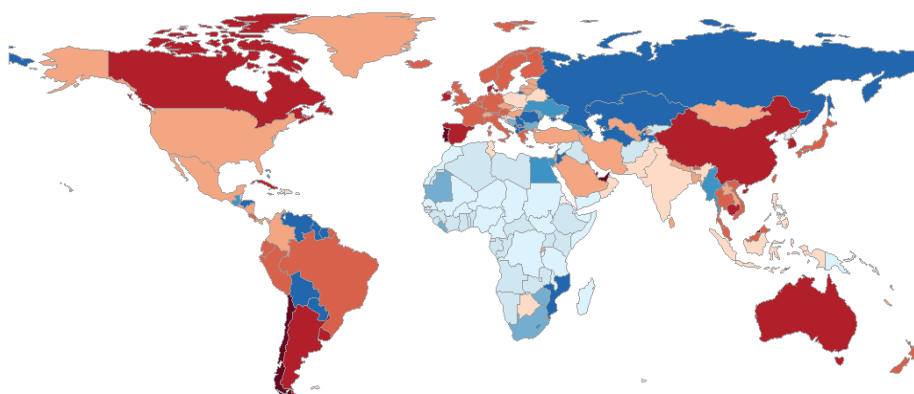
- 62** Determinant factors influencing smartphone customer's brand loyalty in Ho Chi Minh city.

Nguyen Thi Hong Nguyet

CONTENTS

APRIL 2023 • VOLUME 65 NUMBER 1

71



SOCIOLOGY, ANTHROPOLOGY, AND ETHNOLOGY

- 70** Government pandemic policies associated with vaccine fund and vaccine diplomacy in response to COVID-19: A critical study of the Vietnamese experience.

*Quy Van Khuc,
Shawn Leu,
Hien Nguyen, Thang Ngo,
Nguyen Truc Le,
Thuy Nguyen,
Hoang Khac Lich,
Thi-Hong Nguyen,
Nguyen Thuy Anh,
Duc-Bao Nguyen,*

*Phuong Luu, Le Thanh Ha,
Nguyen Duc Lam,
Phu Pham, Trung Tran*

- 90** Climate justice in Vietnam's green transformation: A three-dimensional analysis of the green growth and climate change mitigation sectors.

Hoang Khoi Nguyen

- 100** Overview of gender mainstreaming in agriculture and rural development in Vietnam.

*Nguyen Huu Nhuan,
Nguyen Thi Thu Huyen,
Ngo Thi Khanh Ly*

JURISPRUDENCE

- 110** Using expert evidence on intellectual property: A practical perspective.

Huu Can Nguyen

- 116** Vietnam and its international commitments and obligations of human rights: The case of the individual rights to life, liberty, and personal security in the time of COVID-19.

*Van Nghia Hoang,
Van Anh Pham*

Mindsponge-based investigation into the non-linear effects of threat perception and trust on recycled water acceptance in Galicia and Murcia, Spain

Minh-Hoang Nguyen^{1, 2}, Thi-Phuong Nguyen³, Hong-Son Nguyen⁴, Viet-Phuong La^{1, 5}, Tam-Tri Le^{1, 5*},
Phuong-Loan Nguyen⁶, Minh-Hieu Thi Nguyen^{7, 8}, Quan-Hoang Vuong^{1, 5}

¹Centre for Interdisciplinary Social Research, Phenikaa University, Yen Nghia Ward, Ha Dong District, Hanoi, Vietnam

²Graduate School of Asia Pacific Studies, Ritsumeikan Asia Pacific University, Beppu, Oita 874-8577, Japan

³Centre for Crop Systems Analysis, Wageningen University, P.O. Box 430, 6700 AK Wageningen, The Netherlands

⁴Office of CPV Central Committee, 1A Hung Vuong, Quan Thanh Ward, Ba Dinh District, Hanoi, Vietnam

⁵A.I. for Social Data Lab(AISDL), Vuong & Associates, 3/161 Thinh Quang, Thinh Quang Ward, Dong Da District, Hanoi, Vietnam

⁶Spanish Department, Hanoi University, Km 9, Nguyen Trai Street, Trung Van Ward, Nam Tu Liem District, Hanoi, Vietnam

⁷School of Psychology, Massey University, Auckland 0745, New Zealand

⁸Faculty of Management and Tourism, Hanoi University, Km 9, Nguyen Trai Street, Trung Van Ward, Nam Tu Liem District, Hanoi, Vietnam

Received 14 November 2022; revised 20 January 2023; accepted 10 February 2023

Abstract:

The water scarcity crisis is becoming more severe across the globe and recycled water has been suggested as a feasible solution to the crisis. However, expanding the use of potable and recycled public water has been hindered by public acceptance. Previous studies suggest threat perception and trust of provided information have positive linear relationships with recycled water acceptance. However, given the complex filtering role of trust in the human mental process, we argue that the effects of threat perception and trust may have non-linear relationships with acceptance of recycled water for drinking. To support and validate this argument, we employed Bayesian Mindsponge Framework analytics on 726 Spanish residents. We found that individuals more concerned about water shortage are less likely to accept using recycled water for drinking if their trust in the water quality and safety is low. Meanwhile, people more concerned about water shortage are more likely to accept using recycled water for drinking if they trust the water quality and safety. The findings suggest the non-linear relationships between threat perception, trust, and recycled water acceptance while validating mindsponge-based reasoning. Moreover, the results also highlight the importance of trust in influencing the mental process's outcome: recycled water acceptance.

Keywords: non-linear relationship, recycled water acceptance, Spain, threat perception, trust.

Classification numbers: 1.4, 7

1. Introduction

The global water scarcity crisis is increasingly severe due to more frequent and prolonged droughts induced by climate change, unprecedented population growth, and rapid economic development all resulting in increased water supply needs. For example, a large share of freshwater (ca. 70%) is needed for the agricultural sector [1]. Human anthropogenic activities, such as deforestation and depletion of environmental resources, have seriously reduced the quantity and quality of naturally available water sources. Though the natural recycling process is closed, human-related activities might block natural

water flow via their negative interventions in natural water bodies such as rivers, lakes, groundwater, and wetlands [2]. It is expected that 1,800 million people in the world will live in areas with serious water scarcity and more than 60% of the world population might be under dire conditions of water shortages. One of the remarks being stressed on the Food and Agriculture Organization (FAO) webpage is, "If we don't change our habits now, global demand for water could increase by 50% by 2030", which is not too far from now [3].

The use of recycled water is real and present in many parts of our planet. It raises extensive concern

*Corresponding author: Email: tri.letam@phenikaa-uni.edu.vn

from multiple stakeholders, especially the public, the end user of water [4], indicating an urgent need for alternative water sources. This issue leads to local, national, and international calls for effective measures to reduce pressure on water demand (e.g., reducing daily water consumption) and water suppliers. Out of potential alternative water sources, e.g., stormwater, greywater, seawater, and wastewater, recycled wastewater seems to be a cost-effective and environmentally friendly solution thanks to scientific and technological development [5, 6].

Despite recycled wastewater's feasibility and positive effects, its acceptance by the public community is still limited. Wastewater is water drained from human excretion to municipal wastewater, such as water from toilets, bathrooms, kitchens, and laundry. The public queries the health-related quality of reclaimed water and places trust in the clarity of information related to the process of water recycling. Firstly, recycled water could contain miscellaneous deposits of household or garden toxins or pharmaceuticals [2]. Secondly, this water might be contaminated with toxic or dangerous microorganisms that cause infectious diseases. Thirdly, the presence of organic compounds in recycled water could pose future health risks (e.g., pharmaceuticals and pesticide residues). Fourthly, hazardous chemicals might be produced during the water recycling process, possibly not fully eradicated and/or formed in water recycling systems [7].

Due to these potential problems induced by recycling wastewater, community residents are likely to reject or feel dissatisfied with recycled water if there exists concern about its quality [8], safety and reliability [9], recycled water's origins, failure in communication between water authorities and the community, lack of transparency and misunderstanding of water users in the technologies and recycling procedures, and individuals' perceptions of water shortage issues [10]. Recycled water seems to be accepted much more readily for low body contact purposes such as irrigation, watering gardens, and toilet flushing, but very limited in potable water uses (i.e., drinking and cooking). Particularly, the concept of drinking wastewater has not been supported by the public, resulting in the public rejection of water recycling campaigns [4, 5]. In addition, the perceived health risks of drinking recycled water, inadequate distribution infrastructure for supply, cheap potable water resources, and low community awareness of the water crisis have

exacerbated the public denial of recycling water schemes [2, 11].

The low acceptance or strict opposition of the public towards recycled water has led some proposed potable wastewater reuse projects to be ineffectively implemented or abandoned, such as the 1995 East Valley Water Recycling Project in Fernando Valley, Los Angeles and a 2006 recycled water project in Toowoomba, Queensland, Australia [4]. Based on an objective analysis method by reviewing 910 articles screened from the Web of Science Core Collection from 1990 to 2020, L. Li, et al. (2021) [4] revealed that public health and public acceptance are among the hot topics and frontiers of research in water recycling literature, which reveals these issues existing in the society.

Many studies have been conducted to examine the determinants of recycled water acceptance among residents. Evidently, the adoption and willingness to use recycled water are dependent on the individual's perceived severity or awareness of the current crisis, the perceived threat of future water shortages and the probability of water crisis [10], and personal trust in the provided information about the recycling systems, financial costs, the positive effect on the environment, and nutritional value of reclaimed water [8]. Generally, the relationships between threat perception and trust towards the recycling systems with recycled water acceptance tend to be viewed as linear.

However, from the psychological perspective of the mindsponge theory (detailed rationalization will be explained in the next section), recycled water acceptance can be deemed an outcome of a mental process in which trust plays as a "gatekeeper" that allows the absorption of trusted information related to recycled water and exclude distrusted information [12-15]. Therefore, the effects of perceptions related to recycled water, including the threat perception, on recycled water acceptance are conditional on the trust status. Because of this property of trust, we contend that the threat perception of water scarcity and trust in the presented information may have non-linear relationships with recycled water acceptance.

2. Methodology

We employed the mindsponge theory to rationalize the argument and use Bayesian inference to validate it empirically [16, 17]. Specifically, Bayesian Mindsponge Framework (BMF) analytics

was utilized on S. Vila-Tojo, et al. (2022a) [18]'s dataset from 726 Spanish residents. S. Vila-Tojo, et al. (2022a) [18] generated a dataset to study the recycled water acceptance from two Spanish regions with opposite water scarcity levels. The dataset has been employed to examine the reasons for public acceptance or rejection of recycled water [19].

2.1. Mindsponge-based rationalisation

According to the mindsponge theory [12, 20, 21], information must be viewed as valuable by the mind to exist and persist in an individual's mind. Based on the relevant information in the mind, new information is subjectively judged as beneficial or costly [22-25]. On the one hand, lacking water can result in inconvenience and fatality (one can die without drinking water for more than three days). However, the perceived risk of death might not be crucial in the studied population, as they are residents of Spain, a developed country. On the other hand, consuming recycled water is often perceived as costly due to the expectation of negative consequences and other underlying uncertainties derived from recycled water [26, 27]. In a mental process, these perceived risks might negate the perceived benefit of drinking recycled water.

The mindsponge theory suggests that trust also plays an important factor in the information process of the mind [12, 15, 28, 29]. If the mind trusts specific information, it is more likely to allow that information to enter the mindset and subsequently influence later thinking and behaviours. In this case, if people trust the quality and safety of recycled water, they are more likely to accept drinking recycled water while thinking that water shortage affects them directly. In contrast, if people distrust the water quality and safety, they may think and behave oppositely because distrust could make them ignore the option of drinking recycled water, intensifying the perceived impacts of water shortage on themselves.

Thus, we hypothesized that concern about water shortage is associated with the acceptance of drinking recycled water. Still, the association depends on the individual's trust level towards water quality and safety. This hypothesis indicates non-linear relationships between the threat perception and trust towards recycling systems with recycled water acceptance.

The following model is constructed to examine this hypothesis:

$$\text{DrinkRecycledWater} \sim \text{WSImpactSelf} + \text{WSImpactSelf} * \text{SafetyQualityTrust}$$

The description of the variables is presented in Table 1. The logical network of the constructed model is displayed in Fig. 1.

Table 1. Variable description.

Variable	Description	Data type	Coding
DrinkRecycledWater	Agreement with that I use recycled water for drinking	Continuous	0 (strongly disagree) - 10 (strongly agree)
WSImpactSelf	Agreement with that I am concerned that the water shortage will affect me personally	Continuous	1 - strongly disagree 2 - disagree 3 - neutral 4 - agree 5 - strongly agree
SafetyQualityTrust	Agreement with that I trust that they guarantee the safety and quality of water	Continuous	1 - strongly disagree 2 - disagree 3 - neutral 4 - agree 5 - strongly agree

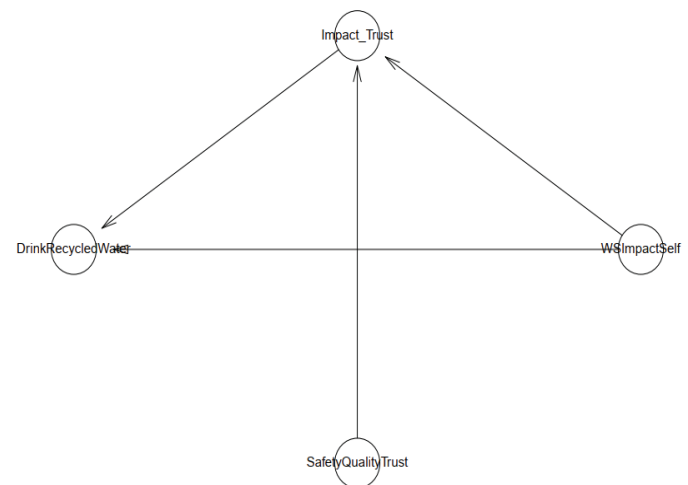


Fig. 1. The logical network of the constructed model.

2.2. Materials and methods

The dataset was collected from two Spanish regions with different levels of water scarcity: Galicia, with an average rainfall of 197 l/m², and Murcia, with an average rainfall of 29 l/m² during October 2019. Galicia is a region located in northwest Spain with approximately 2.7 million residents, while Murcia is situated in south-eastern Spain with almost 450 thousand residents. Participants were chosen via

proportional random sampling based on gender and age. Those who fit the necessary profile (by gender, age, and place of residence) were contacted via email between October 2 and 23, 2019, by a market research firm. In compensation for their responses, the firm rewarded the respondents monetarily. They were given a link to an online questionnaire that took around 15 minutes to complete [18]. All participants gave consent before completing the questionnaire. The University of Santiago de Compostela's bioethics committee approved the study. In total, the survey collection resulted in a dataset of 726 responses, in which 50.1% of the samples were males, 49.45% resided in Galicia, and their mean age was 43.90. S. Vila-Tojo, et al. (2022b) [19]'s statistical analysis showed that the respondents' sex, educational level, employment status, and monthly income in the two study regions were not significantly different.

From the dataset, variable A16, indicating the respondents' thinking of whether they would agree to use recycled water for drinking, was selected as the outcome variable. We selected this variable in the current study as drinking recycled water is the most concerning way of using recycled water. If our postulations are applied to drinking recycled water, they might be applicable to other ways of using recycled water. Variables TP3 (demonstrating the residents' concern about the impacts of water shortage on themselves) and TS1 (demonstrating the residents' trust towards water quality and safety) were selected as predictor variables to check the validity of the mindsponge theory (Table 1).

Bayesian analysis was conducted using the bayesvl R package due to its user-friendly operation method, capacity to visualize eye-catching graphics, and cost-effectiveness [30, 31]. Moreover, the Bayesian analysis is aided by the Markov Chain Monte Carlo (MCMC) method, so it can be applied for a wide range of models, resulting in substantial flexibility [32, 33]. The models were fitted with four Markov chains. Each chain included 5,000 iterations of which the first 2,000 were set as warmup iterations. As the analysis was conducted to check whether the mindsponge theory is valid empirically, we employed uninformative priors for the analysis to avoid subjective bias.

The model's robustness is examined in two ways. First, Pareto smoothed importance-sampling leave-one-out cross-validation (PSIS-LOO) was employed to check the model's goodness-of-fit [30, 34]. The model's goodness-of-fit can be classified into four levels: 1) 'Good' if its k-values are all below 0.5; 2) 'OK' if its k-values are more than 0.5 and below 0.7;

3) 'Bad' if its k-values are more than 0.7 and below 1; and 4) 'Very bad' if its k-values are more than 1. Next, we checked the Markov chain central limit theorem using two diagnostic statistics: effective sample size (n_{eff}) and Gelman-Rubin shrink value ($Rhat$). If the n_{eff} values are larger than 1,000 and the $Rhat$ values equal 1, they will imply good convergence of Markov chains parameters [35, 36]. The Markov chain convergence was also validated visually using trace plots, Gelman-Rubin-Brook plots, and autocorrelation plots.

3. Results

Before interpreting the simulated posterior distributions based on the model constructed above, it is necessary to check the model's goodness-of-fit. As can be seen from Fig. 2, all the k-values are below 0.1, suggesting that the constructed model is a good fit for the data.

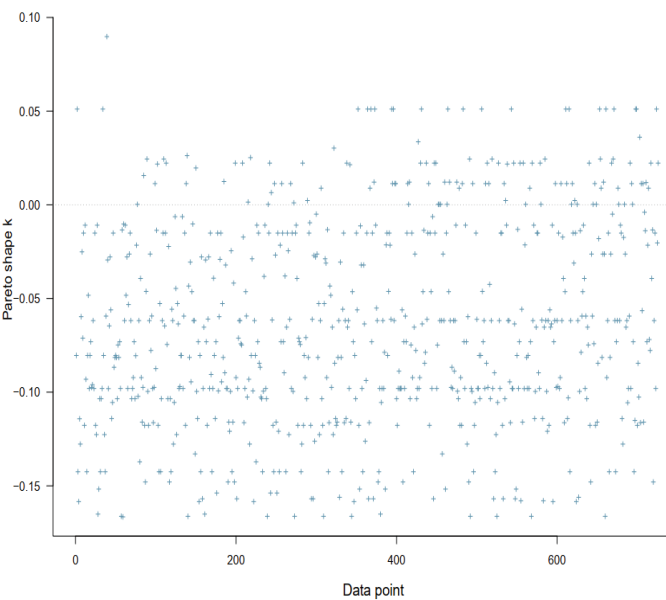


Fig. 2. PSIS diagnostic plot of the constructed model.

Both the n_{eff} values (larger than 1000) and $Rhat$ values hint at the model's good convergence (Table 2). The Markov chains in Fig. 3 further confirm the convergence of the model.

Table 2. Simulated posterior results.

Parameters	Mean	SD	n_{eff}	$Rhat$
Constant	1.90	0.36	6498	1
WSImpactSelf	-0.16	0.12	5765	1
WSImpactSelf* SafetyQualityTrust	0.04	0.02	6498	1

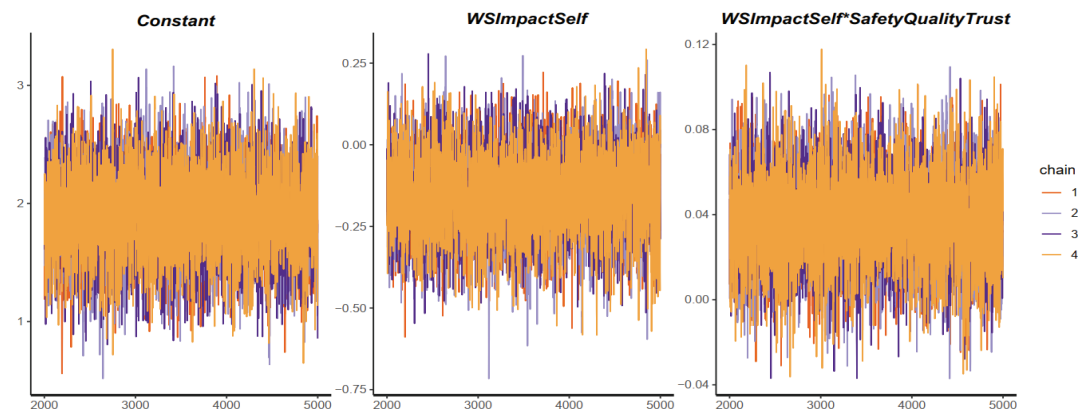


Fig. 3. Trace plots of the constructed model.

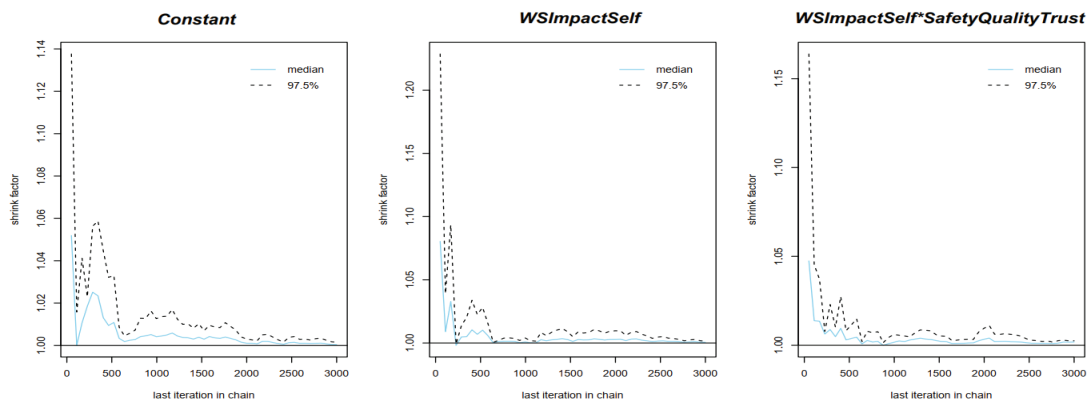


Fig. 4. Gelman-Rubin-Brook plots of the constructed model.

Similarly, the model's convergence signals can also be observed in the Gelman-Rubin-Brook plots (Fig. 4) and autocorrelation plots (Fig. 5). Specifically, the shrink factors in the Gelman-Rubin-Brook plots rapidly decrease to one before the warming phase completes (before the 2,000th iteration), while the autocorrelation levels rapidly decrease to 0 after a specific number of lags (well below 5) in the autocorrelation plots.

From the analysis, we found that the residents' concern about the water shortage impacts on themselves is negatively associated with their acceptance of using recycled water for the sake of drinking ($= -0.16$ and $= 0.12$). The association is positively moderated by the residents' trust in the recycled water quality and safety ($= 0.04$ and $= 0.02$). These associations are reliable, as most of their posterior distributions are located on one specific side of the origin (Fig. 6). Indeed, distribution is on the left, and distribution is on the right.

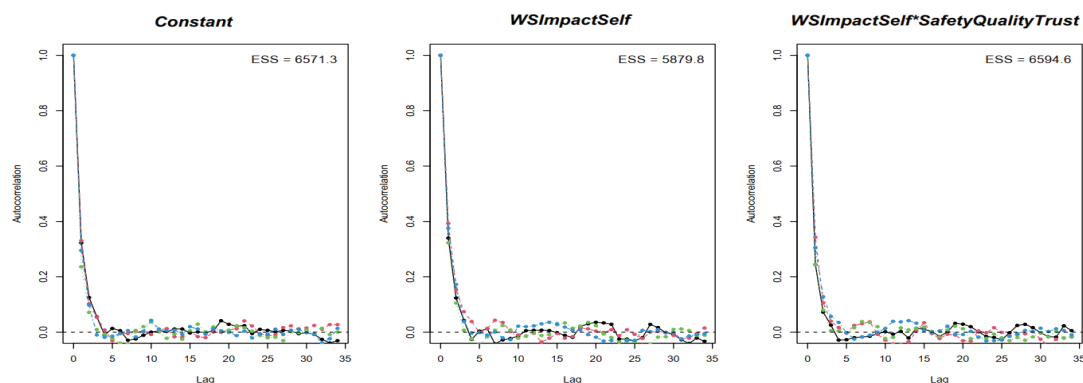


Fig. 5. Autocorrelation plots of the constructed model.

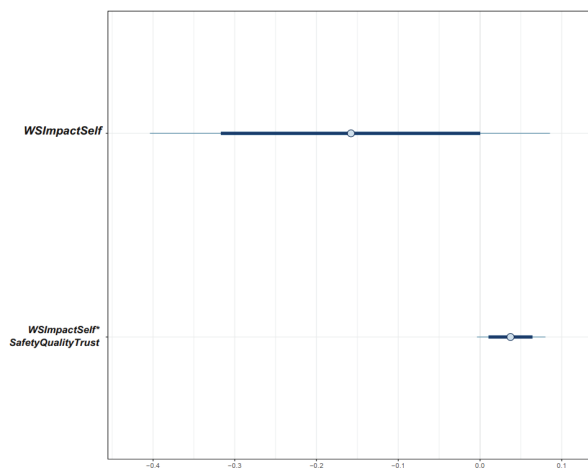


Fig. 6. Posterior distributions of the constructed model.

As it may not be obvious to interpret the results in terms of coefficients, we visualized them in Fig. 7 for better comprehension. The x-axis represents the concern about water shortage, and the y-axis indicates the agreement of the respondents towards using recycled water for drinking ranging from 'strongly disagree' (0) to 'strongly agree' (10). People with more concerned about water shortage are less likely to accept using recycled water for drinking if their trust in the water quality and safety is low. Whereas, people more concerned about water shortage are more likely to accept using recycled water for drinking if their trust in the water quality and safety is high. These findings support the non-linear relationships between recycled water acceptance, threat perception, and trust towards provided information that are rationalised based on the mindsponge theory.

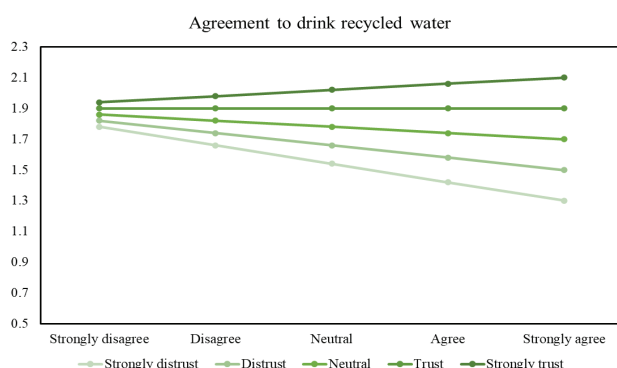


Fig. 7. Recycled water usage acceptance in relation to the concern of water shortage and trust towards the recycled water.

4. Discussion

The current study employed Bayesian Mindsponge Framework analytics on the dataset of 726 Spanish residents' recycled water acceptance to examine the non-linear relationships between recycled water

acceptance, threat perception, and trust. The estimated results suggest that the mental process leading to the acceptance of recycled water is complex and non-linear, validating mindsponge-based reasoning.

Specifically, we found that threat perception due to water shortage has a positive impact on recycled water acceptance for drinking only in scenarios where residents trust the safety and quality of water. If the residents have low trust in water safety and quality, the threat perception adversely affects the recycled water acceptance. Employing mindsponge theory reasoning can help explain these findings [12, 21]. People more concerned about water shortage might also be those more sensitive to water issues, including recycled water safety and quality. Therefore, if they distrust the provided information, their concerns about recycled water safety and quality might be exacerbated. In this case, not drinking recycled water might be deemed more beneficial for them, leading to lower acceptance. Some might argue that water shortage can be fatal for the residents, so drinking recycled water is a better option than death from dehydration. This is reasonable, but only for those with no alternative to recycled water. It should be noted that the samples analysed in the current study were collected in Spain, a developed country, so even though there is a water shortage, the residents might be able to find substitute water sources.

As can be seen in Fig. 7, even when people strongly trust the provided safety and quality information and are strongly concerned about the water shortage, their acceptance score (around 2.1) is still much lower than the threshold of acceptance for using recycled water for drinking. The threshold is around 5 because the acceptance scale ranges from 'strongly disagree' (0) to 'strongly agree' (10). This low acceptance level might be attributed to bad perceptions of recycled water. Recycled water is often generated from water drained from human excretion to municipal wastewater, such as toilets, bathrooms, kitchens, and laundry. Thus, residents might relate the perception of "dust" or "waste" when thinking about recycled water, creating a subjective barrier to accepting this sort of water, especially for drinking.

However, our results show that improving the recycled water acceptance among residents is possible by simultaneously exposing them to the threat of water shortage and building their trust in the safety and quality of recycled water. Frequently communicating the current situation and risks of water shortage in the region will help raise the residents' perceived threat of water shortage. At the same time, a long-term trust-building process is also needed to convince users about the safety and quality of recycled water.

Residents' trust can be built by being transparent about the information related to recycled water and ensuring the provided information is correct and persistent [13, 37]. For example, answering questions of why water should be recycled; how it is recycled; the safety of the water for various purposes including cooking and drinking; and how it has been used. N. Roseth (2008) [38] found that Australians provided with such information were more willing to use recycled water for multiple purposes (including cooking and drinking) and had more positive and less negative attributes associated with recycled water. Moreover, providing two-sided information related to recycled water (positive and negative effects of recycled water) is more effective at increasing residents' trust in the government and recycled water support than providing one-sided information (only positive effects) [39]. Trust can also be improved by enhancing the source's credibility or the perceptions of the water authority's competence and consideration for the community's interests [40].

The current study is not without limitations, so they are presented here for transparency [41]. First, we only tested the non-linear relationships between recycled water acceptance for drinking, threat perception, and trust, so whether the non-linear mental process leading to recycled water acceptance applies to other types of water usage will need further confirmation. Second, the analysed samples were collected in only two Spanish regions, Galicia and Murcia, so they might not adequately represent the Spanish population or other countries. Thus, the current study's results should be interpreted with caution.

5. Conclusions

This study utilised the Bayesian Mindsponge Framework and a dataset consisting of 726 respondents regarding the acceptability of recycled water among Spanish residents in order to probe the dynamic association between recycled water acceptance, threat perception, and trust. The estimated results corroborated the mindsponge-based reasoning, suggesting that the mental process leading to the acceptance of recycled water is complicated and non-linear. Particularly, we discovered that people's trust in the quality and safety of water is required for water scarcity perception to positively affect recycled water acceptability for drinking. Residents' sense of risk reduces their willingness to use recycled water if they have low trust in its safety and quality. Based on these findings, we suggest that people's willingness to use recycled water can be increased by simultaneously making them aware of the dangers of a water shortage and reassuring them of the quality and safety of recycled water.

CRedit author statement

Minh-Hoang Nguyen, Tam-Tri Le, Quan-Hoang Vuong: Conceptualisation; Minh-Hoang Nguyen, Thi-Phuong Nguyen, Hong-Son Nguyen: Methodology; Viet-Phuong La: Software; Quan-Hoang Vuong: Validation, Supervision, Project administration; Phuong-Loan Nguyen, Minh-Hieu Thi Nguyen: Formal analysis; Minh-Hoang Nguyen, Tam-Tri Le, Phuong-Loan Nguyen, Minh-Hieu Thi Nguyen: Investigation; Minh-Hoang Nguyen: Resources; Tam-Tri Le: Data curation; Minh-Hoang Nguyen, Thi-Phuong Nguyen: Writing - Original draft preparation, Reviewing and Editing; Viet-Phuong La, Hong-Son Nguyen: Visualisation.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] World Water Assessment Programme (2016), *The United Nations World Water Development Report 2016*, UNESCO, Paris, France.
- [2] S. Dolnicar, A.I. Schäfer (2009), "Desalinated versus recycled water: Public perceptions and profiles of the accepters", *Journal of Environmental Management*, **90**(2), pp.888-900, DOI: 10.1016/j.jenvman.2008.02.003.
- [3] Food and Agriculture Organization of the United Nations (2022), "Water - at the center of the climate crisis", https://www.un.org/en/climatechange/science/climate-issues/water?gclid=CjwKCAjw5dqqBhBNEiwA7PryaG0EINx8PAQIMeaggZcEahp_ZnG6dTinfPCoTJgVApPVAkcpa7H2KhoCJTlQA vD_BwE, accessed 16 June 2022.
- [4] L. Li, X. Liu, X. Zhang (2021), "Uncovering the research progress and hotspots on the public use of recycled water: A bibliometric perspective", *Environmental Science and Pollution Research*, **28**(33), pp.44845-44860, DOI: 10.1007/s11356-021-15263-w.
- [5] K.S. Fielding, S. Dolnicar, T. Schultz (2018), "Public acceptance of recycled water", *International Journal of Water Resources Development*, **35**(4), pp.551-586, DOI: 10.1080/07900627.2017.1419125.
- [6] Q. H. Vuong (2018), "The (ir)rational consideration of the cost of science in transition economies", *Nature Human Behaviour*, **2**(5), DOI: 10.1038/s41562-017-0281-4.
- [7] S. Toze (2006), "Water reuse and health risks-real vs. perceived", *Desalination*, **187**(1-3), pp.41-51, DOI: 10.1016/j.desal.2005.04.066.
- [8] J. Marks, N. Cromar, H. Fallowfield (2003), "Community experience and perceptions of water reuse", *Water Science and Technology: Water Supply*, **3**(3), pp.9-16, DOI: 10.2166/ws.2003.0002.
- [9] C.M. Dishman, J.H. Sherrard, M. Rebhun, et al. (1989), "Gaining support for direct potable water reuse", *Journal of Professional Issues in Engineering*, **115**(2), pp.154-161, DOI: 10.1061/(ASCE)1052-3928(1989)115:2(154).

- [10] A. Mankad, S. Tapsuwan, M. Greenhill, et al. (2011), "Motivational indicators of decentralised systems use among householders in South East Queensland", *Urban Water Security Research Alliance Technical Report*, CSIRO.
- [11] W.J. Weber (2006), "Distributed optimal technology networks: An integrated concept for water reuse", *Desalination*, **188**(1- 3), pp.163-168, DOI: 10.1016/j.desal.2005.04.113.
- [12] Q.H. Vuong (2023), *Mindsponge Theory*, Sciendo, 218pp.
- [13] Q.H. Vuong, T.T. Le, M.H. Nguyen (2022), "Mindsponge mechanism: An information processing conceptual framework", *The Mindsponge and BMF Analytics for Innovative Thinking in Social Sciences and Humanities*, pp.21-46, DOI: 10.2478/9788367405119-007.
- [14] Q.H. Vuong, M.H. Nguyen, T.T. Le (2021), *A Mindsponge-Based Investigation into the Psycho-Religious Mechanism behind Suicide Attacks*, Sciendo, DOI: 10.2478/9788366675599.
- [15] T.T. Le, M.H. Nguyen, Q.H. Vuong (2022), "Trust in mindsponge: A new perspective on information reliability", *The Mindsponge and BMF Analytics for Innovative Thinking in Social Sciences and Humanities*, pp.67-86, DOI: 10.2478/9788367405119-009.
- [16] M.H. Nguyen, V.P. La, T.T. Le, et al. (2022a), "Bayesian mindsponge framework analytics: A novel methodological approach for social sciences and humanities", *The Mindsponge and BMF Analytics for Innovative Thinking in Social Sciences and Humanities*, pp.87-116, DOI: 10.31219/osf.io/sh9e5.
- [17] M.H. Nguyen, V.P. La, T.T. Le, et al. (2022b), "Introduction to Bayesian mindsponge framework analytics: An innovative method for social and psychological research", *MethodsX*, **9**, DOI: 10.1016/j.mex.2022.101808.
- [18] S. Vila-Tojo, S. Jose-Manuel, E. Andrade, et al. (2022a), "Recycled water acceptance: Data from two Spanish regions with opposite levels of scarcity", *Data in Brief*, **43**, DOI: 10.1016/j.dib.2022.108402.
- [19] S. Vila-Tojo, S. Jose-Manuel, E. Andrade, et al. (2022b), "From scarcity problem diagnosis to recycled water acceptance: A perceptive-axiological model (PAM) of low and high contact uses", *Water Research*, **217**, DOI: 10.1016/j.watres.2022.118380.
- [20] Q.H. Vuong, N.K. Napier (2015), "Acculturation and global mindsponge: An emerging market perspective", *International Journal of Intercultural Relations*, **49**, pp.354-367, DOI: 10.1016/j.ijintrel.2015.06.003.
- [21] Q.H. Vuong, M.H. Nguyen, V.P. La (2022a), *The Mindsponge and BMF Analytics for Innovative Thinking in Social Sciences and Humanities*, Sciendo, 430pp.
- [22] M.H. Nguyen, T.T. Le, H.K.T. Nguyen, et al. (2021), "Alice in suicideland: Exploring the suicidal ideation mechanism through the sense of connectedness and help-seeking behaviors", *Int. J. Environ. Res. Public Health*, **18**(7), DOI: 10.3390/ijerph18073681.
- [23] M.H. Nguyen, T.E. Jones (2022a), "Predictors of support for biodiversity loss countermeasures and bushmeat consumption among Vietnamese urban residents", *Conservation Science and Practice*, **4**(12), DOI: 10.1111/csp2.12822.
- [24] M.H. Nguyen, T.E. Jones (2022b), "Building eco-surplus culture among urban residents as a novel strategy to improve finance for conservation in protected areas", *Humanities & Social Sciences Communications*, **9**(1), DOI: 10.1057/s41599-022-01441-9.
- [25] J. Ruining, T.T. Le, T.T. Vuong, et al. (2023), "A gender study of food stress and implications for international students acculturation", *World*, **4**(1), pp.80-94, DOI: 10.3390/world4010006.
- [26] L. Domènech, D. Saurí (2010), "Socio-technical transitions in water scarcity contexts: Public acceptance of greywater reuse technologies in the Metropolitan area of Barcelona", *Resources, Conservation & Recycling*, **55**(1), pp.53-62, DOI: 10.1016/j.resconrec.2010.07.001.
- [27] B.E. Nancarrow, Z. Leviston, D. Tucker (2009), "Measuring the predictors of communities' behavioural decisions for potable reuse of wastewater", *Water Science & Technology*, **60**(12), pp.3199-3209, DOI: 10.2166/wst.2009.759.
- [28] Q.H. Vuong, T.T. Le, V.P. La, et al. (2022), "The psychological mechanism of internet information processing for posttreatment evaluation", *Heliyon*, **8**(5), DOI: 10.1016/j.heliyon.2022.e09351.
- [29] Q.H. Vuong (2022), "Mindsponge-based theoretical reasoning on the political psychology that begets and empowers a dictator", *The Mindsponge and BMF Analytics for Innovative Thinking in Social Sciences and Humanities*, pp.363-402, DOI: 10.31219/osf.io/k4mjn.
- [30] Q.H. Vuong, M.H. Nguyen, V.P. La (2022b), "Updated protocol for performing BMF analytics using bayesvl", *The Mindsponge and BMF Analytics for Innovative Thinking in Social Sciences and Humanities*, pp.301-370, DOI: 10.2478/9788367405119-015.
- [31] V.P. La, Q.H. Vuong (2019), "Bayesvl: Visually learning the graphical structure of Bayesian networks and performing MCMC with 'Stan'", *The Comprehensive R Archive Network (CRAN)*, <https://philarchive.org/archive/VUOBVL>, accessed 16 June 2022.
- [32] V.H. Nguyen, Q.H. Vuong (2007), "On the martingale representation theorem and on approximate hedging a contingent claim in the minimum deviation square criterion", *Some Topics in Industrial and Applied Mathematics (Contemporary Applied Mathematics)*, pp.134-151, DOI: 10.1142/9789812709356_0008.
- [33] V.H. Nguyen, Q.H. Vuong, M.N. Tran (2005), "Central limit theorem for functional of jump Markov processes", *Vietnam Journal of Mathematics*, **33**(4), pp.443-461.
- [34] A. Vehtari, J. Gabry (2022), "Bayesian stacking and Pseudo-BMA weights using the loo package", <https://mc-stan.org/loo/articles/loo2-weights.html>, accessed 16 June 2022.
- [35] R. McElreath (2018), *Statistical Rethinking: A Bayesian Course with Examples in R and Stan*, Chapman and Hall/CRC Press, 487pp.
- [36] S.P. Brooks, A. Gelman (1998), "General methods for monitoring convergence of iterative simulations", *Journal of Computational and Graphical Statistics*, **7**(4), pp.434-455, DOI: 10.1080/10618600.1998.10474787.
- [37] B.E. Nancarrow (2007), "Community acceptability of the indirect potable use of purified recycled water in South East Queensland and preferences for alternative water sources: A baseline measure", *Urban Water Security Research Alliance Technical Report*, CSIRO.
- [38] N. Roseth (2008), *Community Views on Recycled Water: The Impact of Information*, CRC for Water Quality and Treatment, South Australia, Australia, 81pp.
- [39] J. Price, K.S. Fielding, J. Gardner, et al. (2015), "Developing effective messages about potable recycled water: The importance of message structure and content", *Water Resources Research*, **51**(4), pp.2174-2187, DOI: 10.1002/2014WR016514.
- [40] V.L. Ross, K.S. Fielding, W.R. Louis (2014), "Social trust, risk perceptions and public acceptance of recycled water: Testing a socialpsychological model", *Journal of Environmental Management*, **137**, pp.61-68, DOI: 10.1016/j.jenvman.2014.01.039.
- [41] Q.H. Vuong (2020), "Reform retractions to make them more transparent", *Nature*, **582**, DOI: 10.1038/d41586-020-01694-x.

Application of SEM in analysing the effect of competitiveness, operating effectiveness and risk management on the stability of Vietnamese construction corporations

Thi Le Uyen Vo*, Thi Nga Nguyen

*University of Economics and Law, Vietnam National University - Ho Chi Minh City,
No. 669, Highway 1, Quarter 3, Linh Xuan Ward, Thu Duc City, Ho Chi Minh City, Vietnam*

Received 2 June 2022; revised 22 August 2022; accepted 1 September 2022

Abstract:

This research focuses on analysing the impact of competitiveness as measured through the Lerner competitiveness coefficient, operational efficiency, and risks to financial stability through the Z-score bankruptcy risk ratio of Vietnam's leading prestige construction groups in the context of economic integration. From there, the extent of the influence of factors on the long-term stability and development of corporations operating in the construction sector is inferred. The research data was collected from audited annual financial statements of 17 construction companies operating between 2013 and 2020, with a total of 136 observations. The main research method of this work is the application of SEM linear structure modelling for panel data in multivariable regression analysis. The final results of the study show that most impact variable groups have an influence on the stability of the business. In addition, the results of the study provide an answer on the competitiveness index as having a positive effect in promoting the financial stability of enterprises in the short term. Conversely, if a business abuses this index in the long term, a reaction against the expectations of managers will occur.

Keywords: construction corporation, Lerner, panel data, PLS-SEM, Vietnam.

Classification numbers: 2.1, 2.2

1. Introduction

With the development of the world's construction industry in recent years, showing that the market is gradually entering a saturation cycle, it is necessary to restructure. In order to restructure, manufacturing enterprises in the field of construction investment begin to look to new potential markets with one such market being construction in developing countries. With Vietnam being a developing country, the study of its construction company activities has gradually become an important research topic. By the first 6 months of 2021, nearly 74,000 construction enterprises were operating in Vietnam. A total of 74,000 businesses operating in this field is neither a small number nor an excessive one. However, in the context of developing countries, this number can be seen as a trend toward integration and infrastructure improvement with considerable focus on the need to use modern equipment.

The construction industry in Vietnam has experienced rapid growth in recent years, driven by increased demand for infrastructure and real estate development [1, 2]. According to the General Statistics Office of Vietnam, the construction sector contributed 7.6% to the country's Gross domestic product (GDP) in 2020. This sector also employs a significant portion of the country's labour force, with over 5.7 million people working in construction-related occupations. Vietnamese construction corporations range from small and medium-sized enterprises to large multinational companies. The sector is dominated by state-owned enterprises, which hold a significant market share in areas such as infrastructure development and public works. However, private sector participation has been increasing in recent years, particularly in areas such as real estate development [3]. The construction industry in Vietnam faces several challenges, including issues

*Corresponding author: Email: uyenvtl@uel.edu.vn

related to land acquisition, access to financing, and a shortage of skilled labour. This sector is also highly regulated with a complex regulatory environment that can make it difficult for companies to navigate [4]. Despite these challenges, the construction industry in Vietnam is expected to continue growing in the coming years, driven by increased investment in infrastructure development and urbanization. This growth presents both opportunities and challenges for construction corporations operating in Vietnam as they must navigate a competitive market while also managing risks related to operational efficiency, financial stability, and regulatory compliance.

Faced with that fact, analysing the influence of competitiveness, operational efficiency, and risk management on the stability of construction corporations in Vietnam is important for several following reasons. The first reason is to enhance the competitiveness of companies operating in this field. Competitiveness is a critical factor for any business, including construction corporations in Vietnam. Analysing the influence of competitiveness on stability can help construction corporations identify areas where they need to improve to remain competitive in the market. This can include identifying ways to reduce costs, improve quality, and increase innovation. The second reason is being able to help these companies improve their operational efficiency. Efficient operations are essential for any business to achieve sustainable growth and profitability. By analysing the influence of operational efficiency on stability, construction corporations can identify areas where they can improve efficiency such as streamlining processes, reducing waste, and increasing productivity. The third reason is that in-depth research on the above topic can improve risk management for construction companies in Vietnam. Indeed, risk management is essential for any business to mitigate potential threats and ensure long-term stability. By analysing the influence of risk management on stability, construction corporations can identify areas where they need to improve their risk management practices, such as implementing effective risk management policies, procedures, and controls. The last reason is that conducting research on this topic promotes the stability of companies operating in the construction sector in Vietnam. Certainly, stability is crucial for construction corporations in Vietnam to achieve sustainable growth and profitability. By analysing the influence

of competitiveness, operational efficiency, and risk management on stability, construction corporations can identify areas to focus their efforts to promote long-term stability and success. As such, analysing the influence of competitiveness, operational efficiency, and risk management on the stability of construction corporations in Vietnam is essential for ensuring the long-term success of these businesses. By identifying areas for improvement and implementing effective strategies, construction corporations can enhance their competitiveness, improve operational efficiency, manage risk effectively, and promote stability for sustainable growth and profitability.

Every year, the construction industry contributes trillions of dong to the State budget. However, research works from an economic perspective on the construction industry are quite few. Therefore, the author summarizes the previous research works from other fields with studies related to competitiveness, operational efficiency, and financial risks to serve as a premise for research. P. Bourke (1989) [5] looked at the operations of banks in 12 countries in the territories in Europe, North America, and Australia to determine profitability inside and outside the bank. Lloyd-Williams' research referred to two competing hypotheses related to market structure and performance: the traditional structure-behaviour-performance model (SCP) and the efficiency hypothesis [6]. Meanwhile, Chronopoulos' study assessed how short-term profits exist and whether that existence is affected by regulatory changes and the recent financial crisis [7]. Further, Saghi-Zedek's work studied the impact of ownership structures on the diversification of banks in Europe, demonstrating that diversifying operations (or incomes) minimizes the volatility of income and the likelihood of bankruptcy [8].

In Vietnam, Tuyen's research codified a number of factors affecting the business performance of enterprises from which to design research models [9]. The influence of competitiveness, operational efficiency, and risk management on the stability of construction corporations in Vietnam has been a subject of interest to researchers and practitioners in recent years. There have been several studies on this topic exploring the relationship between these factors and the stability of construction corporations in Vietnam. For example, N.M. Tran, et al. (2020) [10] investigated the relationship between

competitive advantage, operational efficiency, and stability of construction companies in Vietnam. The study found that both competitive advantage and operational efficiency have a significant positive impact on the stability of construction companies in Vietnam. In another study, T.T. Luu, et al. (2019) [11] examined the impact of risk management on the financial stability of construction enterprises in Vietnam. The study found that risk management has a significant positive impact on the financial stability of construction enterprises in the country. There have been other researchers who have conducted studies on the influence of competitiveness, operational efficiency, and risk management on the stability of construction corporations in Vietnam, namely, T.T.H. Le, et al. (2020), V.T. Nguyen, et al. (2021), N.D. Ngo, et al. (2021) [12-14]. These studies provide further insights into the influence of competitiveness, operational efficiency, and risk management on the stability of Vietnamese construction corporations. However, further research is needed to gain a deeper understanding of the relationships between these factors and their impact on the stability of construction corporations in Vietnam.

The studies conducted in Vietnam on the influence of competitiveness, operational efficiency, and risk management on the stability of construction corporations have yielded some important findings, specifically: i) Competitive advantage and operational efficiency have a significant positive impact on the stability of construction corporations in Vietnam [15]; ii) Risk management has a significant positive effect on the financial stability of construction corporations in Vietnam [16]; iii) Supply chain management and project management also have significant effect on the operational efficiency and performance of Vietnamese construction corporations [12, 14]; and iv) Government policies and regulations, market demand, and the internal capabilities of construction corporations also affect their stability and performance [12, 14].

Besides these notable findings, the literature review related to this topic in Vietnam also identified some gaps in the existing literature. That is, most of the existing studies focus on the relationship between individual factors and the stability of construction corporations without examining the interplay between them. Furthermore, there is a lack of studies that explore the impact of external factors such as

economic and political instability, technological changes, and environmental factors on the stability of Vietnamese construction corporations. Besides this, the existing studies are mainly quantitative and lack qualitative data, which could provide a more in-depth understanding of the factors that affect the stability of construction corporations in Vietnam. However, recent quantitative studies in Vietnam only stop at regression models for panel data such as Pooled OLS, FEM, and REM, which cannot fully capture the impact of factors on the stability of enterprises and their complex relationship. In addition, these regression models are unlikely to account for measurement errors and other sources of variability. One common issue with panel data is that there may be measurement errors in the variables being studied, which can lead to biased estimates. And finally, many of the studies are based on a limited sample size and may not be representative of the entire construction industry in Vietnam.

As mentioned before, construction is a key sector of the Vietnamese economy. Therefore, the success or failure of construction corporations can have a significant impact on the overall health of the economy. By studying the factors that contribute to stability and success in this sector, policymakers and business leaders can make more informed decisions about how to allocate resources and manage risk. In recent years, Vietnam has made efforts to promote competition and efficiency in the construction sector by opening up the market to foreign investors and implementing reforms to improve the regulatory environment. Empirical studies on the relationship between competition, risk management, and stability can help policymakers and businesses understand how these efforts are impacting the sector and identify opportunities for further improvement. In addition, Vietnam has set ambitious targets for infrastructure development and attracting foreign investment is key to achieving these goals. Empirical studies on this topic can help demonstrate to foreign investors that the Vietnamese construction sector is a reliable and stable investment opportunity. Above all, construction has a significant impact on the environment and society, and promoting sustainable development in this sector is critical to achieving Vietnam's long-term development goals. By studying the operation of construction corporations, researchers can identify ways to promote sustainable practices and ensure that construction contributes to, rather than detracts

from, Vietnam's sustainable development goals.

This study aims to evaluate the relationship between competitiveness, performance, and risk of construction corporations in Vietnam. With its outstanding advantages, the structural equation model (SEM) was chosen as the analytical framework for this study to estimate complex, multi-level relationships between variables in the research model. The variables included in this study are the endogenous variable (Z-score) used to measure stability, exogenous potentials used to measure efficiency, competitiveness and risk liquidity, and a number of macro factors that are added to measure external risks. Furthermore, the PLS-SEM method is used in this study because of the characteristics of the sample data set. The estimated results obtained from the model show that. Based on the obtained results, policy suggestions are proposed to improve competitiveness, enhance risk management effectiveness as well as maintain stability for construction corporations in Vietnam.

2. Theoretical basis

2.1. Competitiveness

The concept of competitive advantage was first proposed by M.E Porter, an American economist, in his 1985 book *"Competitive Advantage: Creating and Sustaining Superior Performance"* [15]. Porter argued that companies could gain a competitive advantage by either achieving lower costs or by differentiating their products or services in a way that customers value. He also introduced the concept of the value chain, which is a framework for analysing a company's activities to understand where it can create value and gain a competitive advantage.

According to D. Dollar, et al. (1993) [16], the concept of competition is as follows: "Competition is a situation in a market in which companies or sellers try to get consumer feedback to achieve specific business goals". Through the competitive process, companies are forced to become efficient and offer more products and services at lower prices to increase the welfare of the economy (Mankiw theory of economics). So, without competitive pressure, the economy does not achieve allocation efficiency, production efficiency, or dynamic efficiency.

Besides the definition of competitiveness, another concept is market power, specifically: "Market competitiveness refers to the company's ability

to increase and maintain prices in the context of economic competitiveness" [16]. Other than monopolies, market power refers to all situations in which companies are likely to raise prices higher than the balance in competitive conditions. That is, competitiveness can arise not only when there is a monopoly but also when there is no monopoly. In the banking sector, typical manifestations of market competitiveness are the ability of banks to earn exclusive profits by offering higher lending rates and lower deposit rates.

2.2. Adjusted Lerner index

J.F.D. Guevara, et al. (2005) [17] argued that the use of the Lerner index to measure market power is still mechanical and that it is necessary to consider some issues in the estimation method when evaluating its meaning. Previously, D.B. Humphrey, et al. (1997) [18] pointed out that the conventional approach to calculating the Lerner index with both assumptions of profitability and cost-effectiveness is unrealistic. Thus, the corrected Lerner index proposed by M. Koetter, et al. (2012)[19] is presented in the following form:

$$Adjusted\ Lerner_{it} = \frac{(\pi_{it} + TC_{it} - MC_{it} \times TA_{it})}{(\pi_{it} + TC_{it})}$$

where π_{it} is the forecast pre-tax profit of the business i at year t , MC_{it} is the long-term marginal cost, TA_{it} is the total assets, and TC_{it} is the total cost. The result of the adjusted Lerner index is a value between 0 and 1, with larger values corresponding to greater competitiveness and vice versa. Then, H. Liu (2013) [20] proposed a formula to measure the Lerner index more easily for businesses that find it difficult to determine their output price, as follows:

$$Lerner_{it} = \frac{Net\ profit_{it}}{Total\ revenue_{it}}$$

2.3. Financial performance

Financial efficiency measures the performance of the business. The operational efficiency of the enterprise is an integrated economic indicator with the purpose of measuring the effective use of input materials to create finished products. In addition, financial efficiency is also a measure that reflects the level of ingenuity and makes the most of integrated resources such as machinery, equipment, and especially human resources.

In essence, financial performance is a comparison between the outputs and the inputs in a given economic period. If we call H financial performance, we have the following formula for measuring financial performance:

$$H = \frac{\text{Output}}{\text{Input factor}}$$

The above formula provides the number of co-outputs produced for every one of the inputs of the business. The higher the H-index, the higher the financial efficiency of the business and vice versa.

2.4. Measures of financial performance (Table 1)

Table 1. Measures of financial performance.

Measure of financial performance	Research
DY dividend yield	T.D.C. Ming, et al. (2008) [21]
Return on total ROA assets	Y. Hu, et al. (2008) [22]
ROE return on equity	Y. Hu, et al. (2008) [22]
Profit margin on ROS revenue	M. Jenkins, et al. (2017) [23]
Return on ROI investment	S.Z.A. Shah, et al. (2011) [24]
Marris market value coefficient	L. Tian, et al. (2008) [25]

Source: Authors' compilation.

There are many indicators used to evaluate the financial performance of an enterprise, of which the two most widely used indicators are the financial performance indicator according to accounting, also known as the financial performance indicator, and profitability measure and market value indicator, also known as the asset growth indicator. For the group of coefficients measured according to accounting results, the study of Y. Hu, et al. (2008) [22] showed that the most commonly used profit indicators to measure financial performance include financial ratios, for example, return on total assets (ROA) and return on equity (ROE). In addition, research by T.D.C. Ming, et al. (2008) [21] also used the dividend yield (DY) assessment index. Besides these, the study by S.Z.A. Shah, et al (2011) [24] used the return on total investment index to evaluate financial performance. According to research by L. Tian, et al. (2008) [25] for the group of market value coefficients, the Marris index is used to assess the financial performance of enterprises by calculating the total market value of equity ownership relative to the book value of equity.

Overall, there are many indicators to assess the financial performance of a business, but ROA and ROE are the two most widely used indicators that measure the performance of a business during an economic period.

2.5. Risk of corporate bankruptcy

A representative indicator for measuring the stability or financial health of a business is the Z-score. E.I. Altman (1968) [26] published the Z-score model as follows:

$$Z\text{-score} = 1.2X + 1.4Y + 3.3Z + 0.64W + 0.999V$$

where X: Working capital ratio to total assets; Y: Retained return ratio on total assets; Z: Ratio of profit before interest and tax on total assets; W: Market value of equity on the book value of total debt; and V: Ratio of sales to total assets.

Meaning of Z-score: $2.99 < Z\text{-score}$ indicates a healthy financial position; $1.81 < Z\text{-score} < 2.99$ indicates the company has no problems in the short term, however, it is necessary to carefully consider its financial condition; $Z\text{-score} < 1.81$ indicates the enterprise has serious financial problems; and with a Z-score of zero, the probability of bankruptcy is 50%.

Signs of bankruptcy risks in construction enterprises are assessed in 5 aspects: growth rate, debt use level, balance in financing policy, solvency, and operational performance according to the results of a study by D.P. Mai, et al. (2020) [27], which was carried out on research data from 40 enterprises operating in the construction industry.

2.6. PLS - SEM modeling

Within the scope of this study, the author uses the technique of analysing a structural model based on the variance using least square estimation. The PLS-SEM modeling is applied for the following reasons. First, PLS-SEM is a structural equation model based on minimizing the residual variance, which makes the model's predictive power more accurate [28]. Second, PLS-SEM is generally considered more suitable when the sample size is relatively small, and the focus is on predictive accuracy rather than model fit. PLS-SEM is also useful when the relationships among the latent variables are complex or nonlinear [29]. Third, the PLS-SEM is used to estimate models with secondary data such as the present research [30]. Fourth, previous research in the field of

marketing has demonstrated that PLS estimates are useful for experimenting with panel data models [31]. Finally, PLS is a variance-based SEM technique that has been prominently used in IS research before. It is suitable for estimating weighting significance, density, and regression coefficients with data of less than 200 observations [32].

The PLS-SEM modeling consists of two components: the internal structure model that includes the path coefficients between the latent variables and the measurement model, which involves estimating the factor loadings for the observed variables, and the latent variable scores. The PLS-SEM algorithm is an iterative procedure that simultaneously estimates the latent variable scores and model parameters using a combination of regression and covariance estimation methods. The algorithm is designed to provide a flexible and robust approach to modelling complex relationships among latent variables. The estimation algorithm of the PLS-SEM model includes 6 steps. Initially, the PLS-SEM algorithm starts by initializing the values of the model parameters including the loadings, path coefficients, and error variances. The next step is to estimate the measurement model. This is done using a series of regression equations that relate each observed variable to its corresponding latent variable. Next, the PLS-SEM algorithm estimates these coefficients using partial least squares regression. This involves calculating the covariance between the latent variables and then projecting these covariances onto a set of orthogonal latent variables, called the PLS components. The path coefficients are then estimated as the regression coefficients between the PLS components. Then, the PLS-SEM algorithm iteratively updates the parameter estimates based on the results of the previous estimation steps. The algorithm continues to iterate until the parameter estimates converge to stable values. Once the parameter estimates have converged, the PLS-SEM algorithm can be used to generate bootstrap resamples of the data. This involves randomly sampling observations from the original data set and then re-estimating the model parameters for each resample. This allows researchers to estimate the standard errors of the parameter estimates, and to test the statistical significance of the estimated relationships. Finally, the PLS-SEM algorithm provides a set of fit indices to evaluate the overall fit of the model to the data. These indices include measures of model fit, such as the root mean square error of approximation (RMSEA) and the goodness-of-fit index (GFI).

3. Data and research models

3.1. Data

The data was collected from audited annual financial statements of 17 enterprises in the construction industry operating between 2013 and 2020. The dataset is a balanced panel with 136 observed variables that have been synthesized, processed, and designed using Excel. As such, the sample size of this study is considered large enough and statistically significant. With this data, we use Stata 15.0 to perform estimation and necessary inspections besides performing tests such as multicollinear, heteroskedasticity as well as similar phenomena. Finally, once the results of the study are obtained, we use the theories studied in combination with objective facts to explain the economic implications of the correlation between explanatory variables and independent variables to clarify the study results.

The variables used in the research model include (Table 2):

Dependency variable:

- Z-Score: this index is often used to measure the stability of a business.

Independent variables:

- Competitiveness measurement variable group:
 - o Lerner: Competitiveness coefficient (Lerner index)
 - o LernerS: Square competitiveness coefficient (Lerner square index)
- Bank efficiency variable group - Eff:
 - o ROA: Return on total assets
 - o ROE: Return on equity
 - o Size: Enterprise size
- Financial risk group - Risk: Liquidity risk (LIQ).
- The impact of macro factors - INF: Inflation rate.

3.2. Modelling approach

This analysis inherits the research approaches of several authors on measuring the stability of financial enterprises [33-35] to further develop new impact variables to the research topic. The research model illustrated in Fig. 1 is represented by the following equations:

$$\text{Lerner}_{it} = \text{Lerner}_{it-1} + \text{Eff}_{it} + \text{Risk}_{it} + \varepsilon_{it} \quad (1)$$

$$\text{Eff}_{it} = \text{Eff}_{it-1} + \text{Lerner}_{it} + \text{Risk}_{it} + \varepsilon_{it} \quad (2)$$

$$\text{Risk}_{it} = \text{Risk}_{it-1} + \text{Eff}_{it} + \text{Lerner}_{it} + \varepsilon_{it} \quad (3)$$

The model that captures the effects between competitiveness, operational efficiency, and risks on the stability of Vietnamese construction corporations is presented as follows:

$$\text{Z-score}_{it} = + \text{Lerner}_{it} + \text{LernerS}_{it} + \text{ROA}_{it} + \text{ROE}_{it} + \text{Size}_{it} + \text{LIQ}_{it} + \text{INF}_{it} + \varepsilon_{it}$$

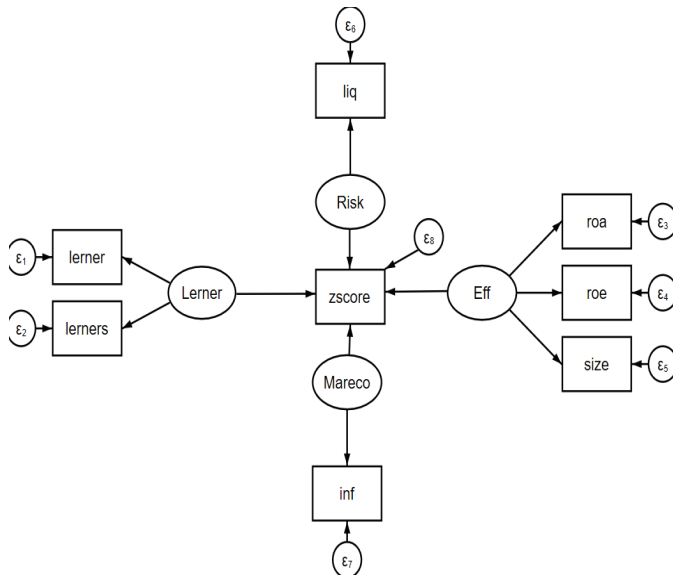


Fig. 1. Research diagram. Source: The audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

Table 2. Table describing variables and their measurements.

Variables name	How to measure	Sign of expectation	Sources of reference
<i>Dependent variable</i>			
Z-score			E.I. Altman (1968) [26]
<i>Independent variables</i>			
Lerner	Net profit / Total revenue	+	H. Liu (2013) [20]
LernerS	(Lerner)	-	C. Müller, et al. (2018) [36]
ROA	Net profit/ Total assets	+	S.M.K. Rahman, et al. (2021) [37]
ROE	Net profit / Equity	-	B.K. Guru, et al. (1999) [38]
Size	Logarithm total assets)	-	D.K. Chronopoulos, et al. (2015) [39]
LIQ	Short-term assets / Total assets	+	N. Al-Fayoumi, et al. (2019) [40]
INF	Secondary data	-	K. Bourkhis, et al. (2013) [41]

Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

4. Results

4.1. Check stationarity in panel datasets

Table 3. The result of stationarity in panel data.

Variables	Levin-Lin-Chu accreditation		Result
	t-Statistic	P-value	
Z-score	-9.9778	0,0000	Stationary
Lerner	-12.1669	0.0000	Stationary
LernerS	-14.8302	0.0000	Stationary
ROA	-3.6048	0.0002	Stationary
ROE	-19.2800	0.0000	Stationary
Size	-12.2100	0.0000	Stationary
LIQ	-20.0979	0.0000	Stationary
INF	-9.6081	0.0000	Stationary

Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

In order to check the stability of the data, a unit root test panel was made using A. Levin, et al.'s testing [42]. The test results presented in Table 3 show that all the time series are stationary because their p-values are approximately zero.

4.2. Descriptive statistics

Table 4. Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Z-score	136	1.969711	0.9500395	0.0972227	4.871875
Lerner	136	0.0833735	0.0854404	-0.0121704	0.7998243
LernerS	136	0.2668314	0.1169139	0.0332431	0.894329
ROA	136	0.0537743	0.0484118	-0.016815	0.2273578
ROE	136	0.136788	0.1047946	-0.032557	0.5250654
Size	136	14.59806	1.255926	11.93862	16.94897
LIQ	136	0.707377	0.2052286	0.1692643	2.043244
INF	136	0.0213875	0.0134314	0.0025	0.0354

Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

Table 4 presents the calculation results based on 136 observations (17 enterprises x 8 years) including values of mean, median, standard deviation, minimum, and maximum. The results in Table 4 indicate that the data of both the size and

INF are relatively stable because all observations are within the range of two times the standard deviation compared to the average. The volatility in the data of the remaining variables is very strong and all variables contain outliers. Although the mean of the Z-score is 1.96, which proves that the enterprise has no problems in the short term, the range of the data is very large. There are businesses with Z-score coefficients both smaller and larger than 1.96. Therefore, it is necessary to carefully consider the financial condition of these construction businesses. On the liquidity side of construction companies, the average value reaches a threshold of 0.7. From a theoretical perspective, the index $LQ = 0.7$ reflects the liquidity of the business enterprise as being relatively good in the short term. This is because a loan of 1 unit guarantees a payment of 0.7 unit from the property with the same currency. Note that this is only the average liquidity of the observed businesses. Due to the variation of liquidity (0.169264; 2.04324), some businesses are at risk of liquidity.

4.3. Correlation-coefficient matrix

Table 5. Pearson correlation-coefficient matrix (r).

Variables	Z-score	Lerner	LernerS	ROA	ROE	Size	LIQ	INF
Z-score	1.0000							
Lerner	0.1386	1.0000						
LernerS	0.2162	0.9241	1.0000					
ROA	0.7700	0.3815	0.5139	1.0000				
ROE	0.4648	0.2477	0.3650	0.7839	1.0000			
Size	-0.3058	0.0014	-0.1153	-0.2962	-0.0618	1.0000		
LIQ	0.2627	-0.1330	-0.1641	-0.0053	-0.0044	0.1194	1.0000	
INF	0.0452	0.1492	0.1274	-0.0645	-0.0534	0.2300	0.1324	1.0000

Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

The correlation coefficient of each pair of variables is presented in Table 5. Most of the observation variables are not correlated with each other because the correlation coefficient of their pairs is quite low with exception for the variable pairs ROA and Lerner's, ROA and LernerS, ROA and ROE, and

ROE and LernerS. Therefore, there may be multicollinearity in the research model. However, tests of multi-collinearity between exogenous variables will be performed in the subsequent section to detect and handle problems of the model (if any).

4.4. Multicollinearity test

Table 6. Results of multicollinear test.

Variables	Lerner	LernerS	ROA	ROE	Size	LIQ	INF	Mean VIF
VIF	9.59	8.08	3.7	2.83	1.34	1.12	1.1	3.96
1/VIF	0.10428	0.12376	0.27027	0.35336	0.74627	0.89286	0.90909	

Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

The variance inflation factor (VIF) is often used as a general diagnostic measure of multicollinearity and is a significantly better approach than using simple correlation coefficients. Calculated results of the VIF are presented in Table 6. Because all VIF values for the pairs are less than 10 and the mean VIF = 3.96, there is no multicollinearity between the variables in the model [43].

4.5. Estimation results of PLS-SEM

4.5.1. Estimated results of the parameters in the model

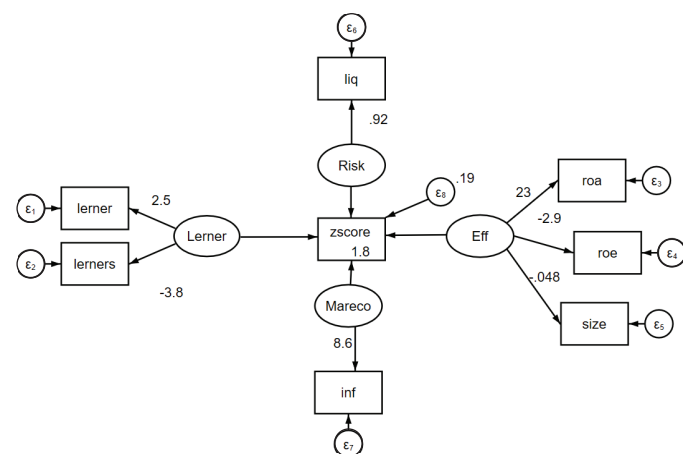


Fig. 2. Research diagram after SEM estimate. Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

The estimated results of PLS-SEM are shown in Fig. 2 and illustrated in more detail in Table 7 below. The regression parameters of the variables Lerner

and LernerS are both statistically significant at the 5% level, so competition considerably affects the stability in the operation of construction corporations in Vietnam. Furthermore, the values of the estimated coefficients show that the Lerner index has a positive effect on the Z-score with decreasing amplitude (because the coefficient of LernerS is negative).

Table 7. Estimated results of the measurement model.

Structural	Coef.	z	P value
Z-score			
Lerner	2.48605	1.96	0.050**
LernerS	-3.838651	-3.80	0.000*
ROA	23.445	15.38	0.000*
ROE	-2.919639	-4.72	0.000*
Size	-0.0483496	-1.36	0.172
LIQ	0.9244342	4.76	0.000*
INF	8.569036	2.86	0.0004*

Note: (*) and (**) correspond respectively to 5% and 1%. Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

Based on Table 7, the PLS-SEM with Z-score as the dependent variable is presented in the following form:

$$\text{Z-score}_{it} = 1.778 + 2.486\text{Lerner}_{it} - 3.838\text{LernerS}_{it} + 23.445\text{ROA}_{it} - 2.919\text{ROE}_{it} - 0.048 \text{Size}_{it} + 0.924\text{LIQ}_{it} + 8.569\text{INF}_{it} + \varepsilon_{it}$$

The results in Table 7 also show that the macro environment represented by inflation, liquidity risk, and return on total assets all have a positive effect on the stability of these construction corporations since all of their estimated coefficients are greater than 0 and statistically significant at the 5% level. In contrast, ROE has a negative effect on the Z-score at a 5% significance level, while the size of these construction corporations does not affect the stability of their operations.

4.5.2. Checking the stability of the model

To ensure accuracy and reliability of the model, some tests were performed and the results obtained are shown in Table 8. The Chi-squared test statistic (χ^2), which indicates the overall fit of the model, is 206.626 with a p-value of 0.00. This shows that the

model goodness of fit at the 5% significance level.

The RMSEA and SRMR indices are also considered important indicators to determine the fit of the model [44]. According to these authors, if the RMSEA and SRMR indices are less than 0.05, the model is a good fit. The results in Table 8 show that both RMSEA and SRMR are close to 0, so this estimated model is reliable. In addition, the pclose index, which is the probability that the RMSEA is less than or equal to 0.05, is approximately equal to 1. This shows that the RMSEA is always less than 0.05. In other words, the model has high reliability with very small prediction error.

Table 8. Test statistics of the model.

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(29)	0.000	Model vs. saturated
chi2_bs(48)	206.626	Baseline vs. saturated
p > chi2	0.000	
Population error		
RMSEA	0.000	Root mean squared error of approximation
90% CI, lower bound	0.000	
upper bound	0.000	
pclose	1.000	Probability RMSEA ≤ 0.05
Information criteria		
AIC	-1838.60	Akaike's information criterion
BIC	-1812.52	Bayesian information criterion
Baseline comparison		
CFI	1.000	Comparative fit index
TLT	1.000	Tucker - Lewis index
Size of residuals		
SRMR	0.000	Standardized root mean squared residual
CD	0.786	Coefficient of determination

Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

In addition, the two indicators CFI and TLI both support the results from the previously reviewed indicators. Their values are all greater than 0.95, which confirms that the model fits very well. The

coefficient of determination of the model is 0.786, showing that the model has explained nearly 79% of the total variation of stability in the operation of randomly selected construction corporations in Vietnam.

Next, the fit of the structural regression model is also considered. Indicators for evaluation have been calculated and are presented in Table 9. In Table 9, the result of the overall index is 0.7860447. This means that the effect between competitiveness, operational efficiency, and financial risk explained about 78.6% of the stability through the Z-score index of Vietnamese construction corporations with the observational data for the period 2013-2020.

Table 9. The results of testing the fit of the structural regression model.

Dep. Var.	fitted	Variance predicted	Residual	R-squared	mc	mc ²
observed						
Z-score	0.9030982	0.7098755	0.1932226	0.7860447	0.8865916	0.7860447
Overall				0.7860447		

Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

In general, all the indicators to evaluate the fit of the model show that the model is suitable. Thus, the results obtained from the model can be considered reliable. Some analysis and discussion is presented in the next section by looking at the estimated results of the model.

5. Discussion

Some analysis was done based on economic-financial theories and the estimation results of the internal structure model is illustrated in Table 10.

Table 10. Estimation results of the internal structure model.

Structural	Coeff.	z	P value
Z-score			
Lerner	2.48605	1.96	0.050**
ROA	23.445	15.38	0.000*
LIQ	0.9244342	4.76	0.000*
INF	8.569036	2.86	0.0004*

Note: (*) and (**) correspond respectively to 5% and 1%. Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

First, the authors discuss the Lerner index that represents competitiveness. This variable has a positive effect (+) on the Z-score variable, i.e., in the short term, increasing this competitive index by focusing on increasing sales will have a positive effect on the stability of the business. Therefore, in the short term, focusing on competitiveness through a number of ways such as expanding market share and entering new markets has a positive effect on the value of a business by contributing to improving the financial stability of the company. The results of this study are also in line with the author's expectations. Regarding the short-term payment ratio, which represents liquidity risk, this variable has a positive effect (+) on the Z-score variable, i.e., when the short-term payment ratio increases, the Z-score index falls and with 99% reliability. This can be explained in the following way: an increase in short-term payment ratio means that the business can ensure the ability to pay short-term debts and contribute to reducing financial risk. The results of this study are also in line with the author's expectations. Third, the profitability ratio of total assets (ROA), which represents the performance of construction corporations, has a positive effect (+) on the Z-score variable, that is, when the return rate of total assets increases, the Z-score index drops, and it has a statistically significant level of 1%. According to the author, as businesses improve their profitability, this will help them increase their equity as well as increase their ability to pay their debts, motivate the business to increase investments to scale/grow and capture market share, thus reducing financial risk. The results of this study are also in line with the author's expectations. Finally, the authors discuss inflation index variables (INF), which represents the macroeconomic environment. Inflation has a positive effect on the stability of a construction corporations in the period 2013-2020 in Vietnam. This may not be appropriate without further analysis and context. This is because inflation can affect different industries and businesses in depending on their characteristics, market conditions, and strategies. For example, in a highly competitive industry such as the construction industry, an increase in inflation may lead to higher costs of materials and labour, which can affect negatively the profitability and stability of businesses that cannot pass on these costs to their customers. On the other hand, businesses that are able to adjust their prices and negotiate better deals with suppliers may be able to mitigate the negative effects of inflation and even take advantage of the situation to gain a competitive edge. Therefore, to properly

evaluate the relationship between inflation and the stability of a business in Vietnam, it is important to consider various factors such as the industry, market conditions, business strategies, and the specific period under study.

The results obtained from the estimation model, which are presented in Table 11, also show a number of factors that have a negative effect on the stability of these construction enterprises.

Table 11. Variables with a negative effect on Z-score.

Structural	Coef.	z	P value
Z-score			
LernerS	-3.838651	-3.80	0.000*
ROE	-2.919639	-4.72	0.000*
Size	-0.0483496	-1.36	0.172

Note: (*) and (**) correspond respectively to 5% and 1%. Source: Source: Data processed from the audited annual financial statements of 17 enterprises on the construction industry operating between 2013 and 2020.

Regarding to the squared competitiveness index (Lerner Square), this index has a negative effect (-) on the Z-score variable. Although the estimated coefficient of the LernerS index is negative, as mentioned above, the total Lerner effect on the Z-score is positive but with a decreasing margin over time. Indeed, in the long run, increasing or abusing the over-competitive index will have a negative effect on the stability of the business. In other words, the better the competitiveness, the risk is pushed back, leading to increased financial stability. However, when competitiveness increases beyond the equilibrium point, enhancing competitiveness will result in increased risk. The reason is that when Doan focuses on increasing sales but does not balance cash flow, the cost of using WACC capital leads to stillness because of potential debts, so, in the long run, this will negatively affect the financial stability of the business. ROE has a negative effect (-) on the Z-score variable, that is, when the return rate of equity decreases, the risk of the Z-score index increases meaning there is a risk to the business and it has a statistically significant level of 1%. Basically, ROE, which represents the performance of a business, can potentially have a negative effect on the stability of construction corporations in Vietnam in this period if it is low. A low ROE could indicate that the company is not generating enough profit from its assets or investments, which could lead to financial difficulties and instability. Additionally, if a company

is consistently generating low returns, it may struggle to compete with other firms in the industry, which could also lead to instability. However, if ROA and ROE are high and consistent, it could indicate that the company is operating efficiently and effectively, which could contribute to stability. Considering the size of the company, the results of the study indicated that the size of the corporate bank in this case has no impact on the Z-score index due to the P-value size = 0.172 > 5%, inferring that the size variable is not statistically significant. It is possible that in some cases, the size of the construction business may not have a significant effect on the stability of construction corporations in Vietnam in the period 2013-2020. This may occur when the construction corporations are well-managed and have efficient operations and risk management strategies, regardless of their size. Additionally, it may also depend on the specific context and characteristics of the construction industry in Vietnam, as well as the overall economic conditions and regulatory environment. For example, smaller construction corporations may be more agile and able to adapt quickly to changes in the market, while larger corporations may have greater access to resources and economies of scale. Ultimately, the relationship between enterprise size and stability is complex and may vary depending on a range of factors.

6. Conclusions

This study applied PLS-SEM to analyse the impact between competitiveness, operational efficiency, and risks on the stability of Vietnamese construction corporations. This study succeeded in taking advantage of panel data combined with the advantage of reducing the number of dimensions of the observed variables as well as being able to capture the complex relationship between the factors included in PLS-SEM. At the same time, the criteria to evaluate the fit of the model was implemented in this study to check the stability of the proposed model. The test results have shown that the model is reliable and therefore, the results drawn from it should be considered to provide suitable solutions for the operation of construction corporations in Vietnam from 2013 to 2020. This study has found the effects of competitiveness, liquidity risk, and operational efficiency on the stability of construction corporations under the condition that they have to regularly respond to macroeconomic shocks.

This study has contributed to systematize and clarify

theories and concepts related to competitiveness, operational efficiency, and control of financial risks of construction corporations in Vietnam from 2013 to 2020. In addition, it has also partly assessed the positive and negative effects of factors on the stability of enterprises. Specifically, the study revealed the positive effect of the competitiveness index (Lerner), short-term payout ratio (LIQ), and gross profit margin (ROA) as well as the negative effect of return on equity (ROE).

As a result, this research model can provide information about whether the short-term and long-term competitiveness of enterprises is really effective through the Lerner index and the squared Lerner index. Based on that information, managers, policy makers, and investors can make more appropriate decisions at each stage of business operations. Moreover, with the information obtained from the negative effect of ROE, construction enterprises can partially improve their operating and management policies in the context of economic integration and the industrial revolution 4.0, as well as a response to the COVID-19 pandemic. Several strategies that can improve their stability include:

1. To improve operational efficiency: construction companies can focus on improving their efficiency by streamlining processes, reducing waste, and optimizing resource utilization. This will increase productivity, reduce costs, and improve profitability, which in turn can lead to higher ROA and ROE.

2. To invest in technology and innovation: by adopting new technologies and processes, construction companies can increase their efficiency, reduce costs, and improve the quality of their products and services. This can differentiate them from competitors and improve their competitiveness.

3. To implement effective risk management strategies: construction companies should have effective risk management strategies in place to identify, assess, and mitigate risks that may impact their operations. This can help reduce the likelihood of financial losses, which can negatively impact ROA and ROE.

4. To focus on customer satisfaction: construction companies should focus on delivering high-quality products and services that meet the needs of their customers. This can help to improve customer satisfaction and loyalty, which can lead to increased revenue and improved financial performance.

Overall, improving operational efficiency, investing in technology and innovation, implementing effective risk management strategies, and focusing on customer satisfaction can all facilitate construction companies in Vietnam to improve their stability by increasing their ROA and ROE.

CRediT author statement

Thi Le Uyen Vo: Data curation, Writing - Original draft preparation, Writing - Reviewing and Editing; Thi Nga Nguyen: Conceptualisation, Software.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] VietnamCredit (2021), "Vietnam's construction industry overview", <https://vietnamcredit.com.vn/news/vietnams-construction-industry-overview-13983.html>, accessed 15 April 2022.
- [2] T.E. Markets (2021), "Vietnam's construction sector to grow by 7.5% in 2021", <https://www.theedgemarkets.com/article/vietnams-construction-sector-grow-75-2021>, accessed 15 April 2022.
- [3] G.O. Business (2017), "Vietnam construction industry overview", <https://oxfordbusinessgroup.com/overview/building-capacity-investment-infrastructure-and-real-estate-are-expected-drive-growth-vietnam>, accessed 15 April 2022.
- [4] V. Briefing (2021), "Vietnam construction industry trends and opportunities", <https://www.vietnam-briefing.com/news/vietnam-construction-industry-trends-opportunities.html/>, accessed 15 April 2022.
- [5] P. Bourke (1989), "Concentration and other determinants of bank profitability in Europe, North America and Australia", *Journal of Banking & Finance*, **13**(1), pp.65-79, DOI: 10.1016/0378-4266(89)90020-4.
- [6] D.M. Lloyd-Williams, P. Molyneux, J. Thornton (1994), "Market structure and performance in Spanish banking", *Journal of Banking & Finance*, **18**(3), pp.433-443, DOI: 10.1016/0378-4266(94)90002-7.
- [7] D.L. Chronopoulos, H. Liu, F.J. MacMillan, et al. (2015), "The dynamics of US bank profitability", *The European Journal of Finance*, **21**(5), pp.426-443, DOI: 10.1080/1351847X.2013.838184.
- [8] N. Saghi-Zedek (2016), "Product diversification and bank performance: Does ownership structure matter?", *Bank Finance*, **71**(3), pp.154-167, DOI: 10.1016/j.jbankfin.2016.05.003.
- [9] N.L. Tuyen (2013), *Research on Influential Factors to Business Operation Efficiency of Food Processing Industry Firms Listed on The Vietnamese Stock Market*, Master thesis (in Vietnamese).
- [10] N.M. Tran, T.D. Nguyen, T.T.N. Nguyen (2020), "The impact of competitive advantage and operational efficiency on the stability of Vietnamese construction companies", *Journal of Asian Business and Economic Studies*, **27**(2), pp.175-191.
- [11] T.T. Luu, T.N. Phan, H. Dang (2019), "The impact of risk management on the financial stability of Vietnamese construction enterprises", *International Journal of Business and Economics Research*, **8**(3), pp.105-112, DOI: 10.11648/j.ijber.20190303.11.

- [12] T.T.H. Le, H.T. Nguyen (2020), "The effects of competitive advantage, operational efficiency and environmental management on the performance of construction enterprises in Vietnam", *Journal of Business Research*, **114**, pp.203-212, DOI: 10.1016/j.jbusres.2020.04.010.
- [13] V.T. Nguyen, H.T. Nguyen, T.M.T. Tran (2021), "The impact of supply chain management on the operational efficiency of construction enterprises in Vietnam", *Journal of Asian Finance, Economics and Business*, **8(4)**, pp.57-65.
- [14] N.D. Ngo, T.M.T. Nguyen (2021) "The impact of project management on construction performance in Vietnam", *Journal of Engineering, Design and Technology*, **19(3)**, pp.622-639, DOI: 10.1108/JEDT-02-2020-0057.
- [15] M.E. Porter (1985), *Competitive Advantage: Creating and Sustaining Superior Performance*, Free Press, New York, 557pp.
- [16] D. Dollar, E.N. Wolff (1993), "Competitiveness, convergence, and international specialization", *The MIT Press*, 238pp.
- [17] J.F.D. Guevara, J. Maudos, F. Pérez (2005), "Market power in European banking sectors", *Journal of Financial Services Research*, **27(2)**, pp.109-137, DOI: 10.1007/s10693-005-6665-z.
- [18] D.B. Humphrey, L.B. Pulley (1997), "Banks' responses to deregulation: Profits, technology, and efficiency", *Journal of Money, Credit, and Banking*, **29(1)**, pp.73-93.
- [19] M. Koetter, J.W. Kolari, L. Spierdijk (2012), "Enjoying the quiet life under deregulation? Evidence from adjusted lerner indices for US banks", *Review of Economics and Statistics*, **94(2)**, pp.462-480, DOI: 10.2139/ssrn.1996806.
- [20] H. Liu (2013), "Competition and risk in Japanese banking", *The European Journal of Finance*, **19(1)**, pp.1-18, DOI: 10.1080/1351847X.2011.633614.
- [21] T.D.C. Ming, C.S. Gee (2008), "The influence of ownership structure on the corporate performance of Malaysian public listed companies", *ASEAN Economic Bulletin*, **25(2)**, pp.195-208, DOI: 10.1353/ase.0.0016.
- [22] Y. Hu, S. Izumida (2008), "Ownership concentration and corporate performance: A causal analysis with Japanese panel data", *Corporate Governance: An International Review*, **16(4)**, pp.342-358, DOI: 10.1111/j.1467-8683.2008.00690.x.
- [23] M. Jenkins, V. Ambrosini, N. Collier (Eds.) (2017), *Advanced Strategic Management: A Multi-Perspective Approach*, Bloomsbury Publishing, 376pp.
- [24] S.Z.A. Shah, S.A. Butt, M.M. Saeed (2011), "Ownership structure and performance of firms: Empirical evidence from an emerging market", *African Journal of Business Management*, **5(2)**, pp.515-523.
- [25] L. Tian, S. Estrin (2008), "Retained state shareholding in Chinese PLCs: Does government ownership always reduce corporate value?", *Journal of Comparative Economics*, **36(1)**, pp.74-89, DOI: 10.1016/j.jce.2007.10.003.
- [26] E.I. Altman (1968), "Financial ratios, discriminant analysis and the prediction of corporate bankruptcy", *The Journal of Finance*, **23(4)**, pp.589-609, DOI: 10.1111/j.1540-6261.1968.tb00843.x.
- [27] D.P. Mai, D.H. Quynh, T.H. Lam (2020), "Risk identification bankruptcy in construction enterprises in Vietnam", *Accounting and Auditing Journal*, **207**, pp.18-22 (in Vietnamese).
- [28] J. Henseler (2017), "Partial least squares path modelling", *Advanced Methods for Modelling Markets*, pp.361-381.
- [29] E.E. Rigdon (2012), "Rethinking partial least squares path modelling: In praise of simple methods", *Long Range Planning*, **45(5-6)**, pp.341-358, DOI: 10.1016/j.lrp.2012.09.010.
- [30] D. Gefen, E.E. Rigdon, D. Straub (2011), "Editor's comments: An update and extension to SEM guidelines for administrative and social science research", *MIS Quarterly*, **35(2)**, pp.3-14, DOI: 10.2307/23044042.
- [31] M.K. Johnson (2006), "Memory and reality", *American Psychologist*, **61(8)**, pp.760-771, DOI: 0.1037/0003-066X.61.8.760.
- [32] J. Benitez (2016), *Principles and Modern Applications of Mass Transfer Operations*, John Wiley & Sons, 624pp.
- [33] A. Bathory (1984), *Predicting Corporate Collapse: Credit Analysis in the Determination and Forecasting of Insolvent Companies*, London, UK: Financial Times Business Information, 159pp.
- [34] J.H. Boyd, S.L. Graham (1986), "Risk, regulation, and bank holding company expansion into nonbanking", *Quarterly Review*, **10**, pp.2-17, DOI: DOI:10.21034/QR.1021.
- [35] H.T. Vu (2017), "Analysis of factors affecting financial risks of real estate listed companies on the Ho Chi Minh city stock exchange", *Journal of Economics and Development*, **240**, pp.86-93.
- [36] C. Müller, F. Noth (2018), "Market power and risk: Evidence from the US mortgage market", *Economics Letters*, **169**, pp.72-75, DOI: 10.1016/j.econlet.2018.04.033.
- [37] S.M.K. Rahman, M.A.F. Chowdhury, T.C. Tania (2021), "Nexus among bank competition, efficiency and financial stability: A comprehensive study in Bangladesh", *The Journal of Asian Finance, Economics and Business*, **8(2)**, pp.317-328, DOI: 10.13106/jafeb.2021.vol8.no2.0317.
- [38] B.K. Guru, J. Staunton, B. Balashanmugam (1999), "Determinants of commercial bank profitability in Malaysia", *The 12th Annual Australian Finance and Banking Conference*, Sydney.
- [39] D.K. Chronopoulos, H. Liu, F.J. McMillan, et al. (2015), "The dynamics of US bank profitability", *The European Journal of Finance*, **21(5)**, pp.426-443, DOI: 10.1080/1351847X.2013.838184.
- [40] N. Al-Fayoumi, B. Abuzayed, T.S. Arabiyat (2019), "The banking sector, stress and financial crisis: Symmetric and asymmetric analysis", *Applied Economics Letters*, **26(19)**, pp.1603-1611, DOI: 10.1080/13504851.2019.1591581.
- [41] K. Bourkhis, M.S. Nabi (2013), "Islamic and conventional banks' soundness during the 2007-2008 financial crisis", *Review of Financial Economics*, **22(2)**, pp.68-77, DOI: 10.1016/j.rfe.2013.01.001.
- [42] A. Levin, C.F. Lin, C.S.J. Chu (2002), "Unit root tests in panel data: Asymptotic and finite-sample properties", *Journal of Econometrics*, **108(1)**, pp.1-24, DOI: 10.1016/S0304-4076(01)00098-7.
- [43] P.F. Velleman, R.E. Welsch (1981), "Efficient computing of regression diagnostics", *The American Statistician*, **35(4)**, pp.234-242, DOI: 10.2307/2683296.
- [44] D.L. Putnick, M.H. Bornstein (2016), "Measurement invariance conventions and reporting: The state of the art and future directions for psychological research", *Developmental Review*, **41**, pp.71-90, DOI: 10.1016/j.dr.2016.06.004.

Determining factors affecting innovation capacity of students at economic universities in Hanoi

Dieu Linh Ha^{1*}, Thi My Linh Nguyen², Van Hoang Nguyen³,
Gia Huy Tran³, Duc Kien Nguyen³, Khanh Huyen Trinh³

¹Trade Union University, 169 Tay Son Street, Quang Trung Ward, Dong Da District, Hanoi, Vietnam

²VNU University of Economics and Business, 144 Xuan Thuy, Dich Vong Hau Ward, Cau Giay District, Hanoi, Vietnam

³National Economics University, 207 Giai Phong Street, Dong Tam Ward, Hai Ba Trung District, Hanoi, Vietnam

Received 22 February 2023; revised 20 March 2023; accepted 29 March 2023

Abstract:

This study aimed to explore the factors affecting the innovation capacity of students at the National Economics University, Vietnam. Researchers inherited and developed this work based on previous research to focus on analysing and evaluating dynamics, measuring innovation capacity, and the factors affecting innovation capacity of university students. The innovation capacity model is used based on six factors: creativity, self-confidence, personal energy, risk propensity, leadership ability, and ambiguous problem solving. The empirical analysis used data from the survey data of 250 students from the economic sector in Hanoi with reliable tools (SPSS 26.0 software). The data were analysed by frequencies, percentages, means, Pearson's linear correlation coefficient, exploratory factor analysis, and multi-linear regression model based on the survey data. The research results identified the following factors affecting the innovation capacity of university students: personal energy and leadership ability, which have the strongest impact on student innovation capacity. Self-confidence, risk propensity, and ambiguous problem solving had strong effects on student innovation capacity. Finally, creativity also affected student innovation capacity. There is also a positive relationship between all factors and student innovation capacity. Several recommendations are suggested to enhance innovation capacity for students in Vietnam.

Keywords: economic sector, innovation, innovation capacity, university student, Vietnam.

Classification numbers: 2.1, 4.1

1. Introduction

According to the 2020 Future of Jobs Report by the World Economic Forum, innovation capacity ranks first of the top 10 skills needed by 2025. In addition, R.A. Beghetto, et al. (2014) [1] indicated that innovation capacity is gaining attention at the university level and beyond, and is identified as an important skill in the 21st century. Therefore, interest in innovation capacity has attracted the attention of many researchers and university administrators. In addition, future challenges require changes in education [2]. We need to educate a generation of young people who are not only proficient at basic skills and specialized knowledge, but also require an open attitude and broad skills to create new solutions

that meet the needs of the future in a rapidly changing world [2].

The development of innovation is inseparable from the cultivation of senior talents, and the innovation capacity of senior talents is a key feature for the effective implementation of higher education. This requires higher education to use more innovation elements with the rapid development of science and technology in the 21st century. As an important aspect, the innovation capacity of university students is also a key link to improve their comprehensive quality. As a result, during their continuous reforming, more and more universities have begun to focus on the cultivation and improvement of the innovation

*Corresponding author: Email: linhhd@dhcd.edu.vn

capacity of university students, which has gradually become a hot issue in higher education research.

An in-depth study of the factors that affect students' innovative capacity will help students determine which factors have a strong impact on innovation capacity, thereby focusing more on how to develop those factors. This will help students become more confident when entering the labour market, creating positive effects on the economy and society. This article provides an overview of innovation capacity in university students in Hanoi and the factors affecting this capacity, thereby proposing a number of options and solutions to improve innovation capacity of students in the future.

2. Theoretical basis and proposed model

2.1. Innovation capacity

Innovation is one of the main drivers of economic development and national competitiveness improvement. Most people think that the concept of innovation only applies to laboratory technology or research and development (R&D) activities. However, "innovation" is a very broad concept from the macro level, across all fields and industries, to the micro level of organizations and businesses. Innovation capacity can be studied in many ways. J. Schumpeter (1934) [3] supposed that innovation is the intersection between invention and creation to create value for the social economy. Innovation is one of the factors affecting the economy due to technological changes as well as new combinations of existing productive forces to solve business problems. Besides, innovation is the use of new knowledge to create a new service or product that customers want. Indeed, innovation involves the process of invention and commercialization [4]. Moreover, innovation is difficult to measure and requires a tight combination of adequate technical knowledge and excellent market judgment to simultaneously satisfy economic and technological limitations as well as other types of constraints [5]. P. Fan (2010) [6] has studied innovation capacity at the macro level of China and India as these two countries are on the rise. The study showed that China and India have focused on investing resources in R&D and human resources. Since then, the two countries have obtained patents and exported high-tech services/products, demonstrating the importance of the government in enhancing the innovation capacity of businesses and individuals in a country.

In addition, topics on innovation capacity can focus on industries and fields. For example, L. Klerkx, et al. (2009) [7] studied how innovation can be made in agriculture in the Netherlands. The authors showed that brokers are necessary for agriculture to develop and that governments and sponsors need to subsidize quality brokers as well as make efforts to improve broker connections with local people and farmers.

Besides, the innovation capacity for enterprises has also been carefully studied. R. Rohrbeck, et al. (2011) [8] pointed out three tasks/roles that enterprises need to accomplish to promote innovation of enterprises: strategic participation for new business areas, increasing innovative ideas and ultimately enhancing the competition, as well as taking on the challenge of competitors to increase the quality of the project or output of the company.

2.2. Factors affecting innovation capacity

Each field and aspect to be evaluated will have different factors. Thus, it will be difficult to find a universal formula for all areas that require innovation. Regarding the factors affecting the innovation capacity of technology enterprises, T. Koc (2007) [9] believed that the formation of ideas and quality human resources will positively affect the innovation capacity of technology enterprises. However, the factor of functional integration (understood here as combined departments with many specialties) will negatively affect innovation capacity. This study shows that the creation of ideas, high-quality human resources, and high specialization will help technology enterprises innovate.

In addition, external factors also affect the innovation capacity of enterprises. Specifically, research by J. Ferreira, et al. (2017) [10] showed that the geographical location of the company also affects the innovation capacity of employees. This group of authors demonstrated that the closer the company's geographical location is to large, busy urban areas, the higher its innovation capacity. This shows that the surrounding environment is also an important factor for innovation.

Besides, according to J.M. Lewis, et al. (2018) [11], leadership is also a factor affecting innovation. Research by D. Cropley, et al. (2017) [12] showed that innovation is a good thing, that is, when innovation increases, other factors also rise positively. However, innovation and women in companies are feeling a negative influence. This means that women are

being held back by the working environment and innovation does not have a positive effect on them and vice versa.

2.3. Factors affecting students' innovation capacity

There are many studies showing the importance of an educational environment to students' innovation capacity. In a learning environment that supports innovation, learning objectives are clearly stated, instruction is geared towards achieving these goals at both school and classroom levels, and students perceive innovative learning as important for future personal and professional development [1]. Such an environment emphasizes the importance of making learning personally relevant to learners by combining in-school instructional activities with out-of-school experiences by engaging students on practical tasks [13].

M.M. Keinänen, et al. (2019) [14] studied whether a learning environment built according to innovative pedagogy could be associated with students' innovation capacity. The survey subjects in this study are third- and fourth-year students of the University of Applied Sciences in Finland. R. Barnett (1992) [15] defines capacity as a set of knowledge, skills, and attitudes related to practical activities, while F.E. Weinert (2001) [16] defines capacity as skills and techniques that can be used or developed during training to deal with specific situations, readiness for social dynamics, and flexible application in different situations.

According to M.M. Keinänen, et al. (2019) [14], innovative pedagogy includes active learning and teaching methods; multidisciplinary learning environment; employment-oriented and integrated research, development and innovation; flexible curriculum; entrepreneurship; and internationalization. In short, innovative pedagogy is the application of theories learned in school to real life through practical activities to help students become future experts in innovation. The research results show that the more students have experience in innovative pedagogy, the greater the innovative capacity of students.

Regarding research related to the factors affecting the innovation capacity of students, E. Chell, et al. (2009) [2] provided a tool capable of measuring the innovation capacity of young people and tested

it in the UK. These factors included creativity, self-confidence, personal energy, level of risk taking, and leadership. According to E. Chell, et al. (2009) [2], the group of factors that strongly affected the innovation capacity of young people are creativity, leadership, personal energy, and self-confidence. The factor that has the least impact on young people's ability to innovate was the level of risk-taking. In particular, E. Chell, et al. (2009) [2] proposed that the risk propensity factor should be included in teaching, focusing on economic risk so that today's students understand how they can improve society through innovative efforts and further how societies and economies are shaped through appropriate and ethical risk management. Research by E. Chell, et al. (2009) [2] has built and tested a linear structural model to assess the factors affecting the innovation capacity of students in universities. The survey results of 303 students at universities in Hanoi have identified 5 influencing factors and the degree of influence of each factor on students' innovation capacity. Of these factors, skill factor management and social skills had a significant impact on students' innovation capacity.

In addition, A.R. Ovbiagbonhia, et al. (2019) [17] studied factors affecting the innovation capacity of undergraduate students at 8 Universities of Applied Sciences in the Netherlands. The authors inherited the factors from E. Chell, et al. (2009) [2] and added a new element of complex problem solving. The results were quite similar to the results of E. Chell, et al. (2009) [2] showing that factors of creativity, leadership, personal energy, and self-confidence strongly influenced the innovation capacity of students, while the factors of risk-taking and complex problem-solving had much less of an impact. In addition, according to A.R. Ovbiagbonhia, et al. (2019) [17], the learning environment does not support the improvement of students' innovative capacity, but most students are improving their innovation capacity through activities outside of school.

Research by E. Chell, et al. (2009) [2] or A.R. Ovbiagbonhia, et al. (2019) [17] has shown that creativity is one of the factors that has the strongest influence on students' innovative capacity. In addition, R.A. Beghetto, et al. (2014) [1] argue that creativity's effects on innovation capacity has become a hot topic in education. From President Barack Obama to Amazon's Jeff Bezos to "Newsweek"

magazine, business leaders, major media outlets, government officials, and education policymakers are increasingly advocating to incorporate student creativity into the curriculum.

Therefore, the hypothesis is proposed as follows (Fig. 1):

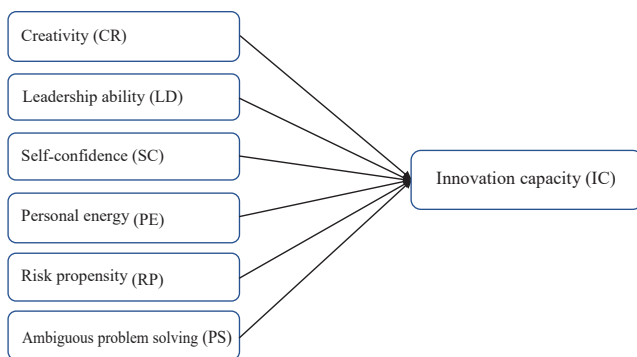


Fig. 1. Research model.

H1: Creativity (CR) has a positive influence on students' innovation capacity.

The concept of self-confidence is supported by P. Tierney, et al. (2002) [18] self-efficacy theory, which describes self-confidence as a belief in oneself in terms of having the necessary knowledge, skills, and abilities to perform a specific task. Therefore, confidence is the degree to which a person believes in himself and has creativity in his approach to a subject, as evidenced by action in problem solving.

Research by E. Chell, et al. (2009) [2] or A.R. Ovbiagbonhia, et al. (2019) [17] showed that confidence did not affect innovation capacity too much. In other words, this factor is only at a low level. However, some authors believe that confidence to a significant extent affects innovation capacity. According to T. Kelley, et al. (2013) [19], innovation will not be generated by reading, thinking, or discussing, but innovation will be created by taking action - step-by-step - through one-on-one experiences of a series of small successes and actions. Similarly, E. Chell, et al. (2009) [2] argue that confidence is just as important as creativity to the learning process, believing in an idea, and a desire for its implementation.

Therefore, the hypothesis is proposed as follows:

H2: Self-confidence (SC) has a positive influence on students' innovation capacity.

Personal energy is understood as motivation, enthusiasm, hard work, persistence, and commitment [2]. To fully develop an innovative idea requires a clear vision of the end goal, which in turn requires strength, cooperation, direction, and motivation [20]. Having personal energy combined with collective energy allows the project or work to go faster in terms of time as well as better in terms of quality when the whole team is working towards it [20].

Personal energy in the study of E. Chell, et al. (2009) [2] or A.R. Ovbiagbonhia, et al. (2019) [17] is in third place in terms of the degree of influence on innovation capacity, after leadership and creativity. However, personal energy is still one of the most important factors and has a significant influence on innovation capacity. In addition, having positive personal energy will contribute toward a good personal spirit, from which you can think, create breakthrough ideas, put them to the test, and execute to form innovative capacity in the long run.

According to K. Robinson (2011) [21], if there is no personal energy, the creative idea that must undergo many difficult trials and failures will make the individual tired, depressed, and not further pursue the path of turning that idea into an innovation. Similarly, Thomas Edison famously said: "Genius is 1% inspiration and 99% perspiration." In other words, an inspired thought can be fleeting, while production and exploiting it can take months or years.

Therefore, the hypothesis is proposed as follow:

H3: Personal energy (PE) has a positive influence on students' innovation capacity.

Combining risk taking and risk calculation in decision making as well as risk assessment among options [2], previous studies have suggested that the more people are inclined to take risks, the higher the level of innovation [22].

Risk propensity is a factor that has a low effect on innovation capacity [2]. The reason given is that the University has not focused on guiding and teaching students about risk assessment as well as providing steps to analyse risks and draw appropriate conclusions [17].

According to E. Chell, et al. (2009) [2], the innovation process has uncertain outcomes and, in this sense, innovation leaders are said to have the capacity to accept a high degree of risk. On the other hand, when taking risks or blindly taking risks, an

individual can sometimes get lucky when the risk pays off - but this only happens occasionally.

In contrast, the risk actuary takes steps to manage the risks involved, identify them, and consider ways to reduce them. Taking such calculated risks reduces the risk of failure and promotes the likelihood of achieving the desired goal. Therefore, risk propensity (calculated) is determined to affect innovation capacity.

Therefore, the hypothesis is proposed as follows:

H4: Risk propensity (RP) has a positive influence on students' innovation capacity.

Leadership ability shows vision and ability to mobilize commitment [2]. Similarly, J.H. Dyer, et al. (2009) [23] states that leadership involves having a clear vision of the end goal, networking, cooperation, mobilizing, organizing, and persuading other professionals to goal realization.

Leadership in previous studies is the strongest influence on innovation capacity [2]. According to J.M. Burn (1996) [24], E. Chell (2001) [25] argues that in the context of an innovation process, a leader can effectively communicate their vision to others, persuade others about its quality and potential, gather logical arguments to gain support, and eliminate opponents. One such skill is arguably crucial throughout the innovation process. The person in charge of innovation also requires support and assistance from others, and to gain that support, leadership skills need to be prominent and demonstrated [26].

Therefore, the hypothesis is proposed as follow:

H5: Leadership (LD) ability has a positive influence on students' innovation capacity.

Ambiguous problem solving is a factor representing a person who is willing to change his/her point of view if the current view is no longer relevant. In addition, they think broadly to solve problems well, are willing to solve unprecedented problems, and are not afraid of innovative thinking [27].

Currently, this factor has only been added to the study of A.R. Ovbiagbonhia, et al. (2019) [17]. This study shows that the ability to solve complex problems accounts for low scores when affecting students' innovation capacity, similar to the risk-taking factor. In addition, the authors found that with the current level of development, problems gradually

become more complex, and there are many aspects that need to be solved. Improving the ability to solve complex problems will help students acquire solid skills and solve problems quickly in the stage of realizing innovation.

Therefore, the hypothesis is proposed as follows:

H6: Ambiguous problem solving (PS) has a positive influence on students' innovation capacity.

3. Results and discussion

3.1. Statistics of the demographic characteristics

The completed questionnaire was sent to students at universities of economics in Hanoi. There were 250 valid questionnaires received. In order to perform exploratory factor analysis (EFA), the sample size must be at least 5 times the total number of observed variables [28]. Respondent information is presented in Table 1.

Table 1. Respondent information.

Information		Percentage (%)
Age	Freshman student	29%
	Sophomore student	13%
	Junior student	20%
	Senior student	38%
University	Banking Academy	4%
	Finance Academy	4.4%
	Foreign Trade University	26.4%
	National Economics University	32.8%
	Other Universities	32.4%
Gender	Male	20%
	Female	80%

Source: Authors' calculation from the survey results "Determining factors affecting innovation capacity of students at economic universities in Hanoi" with sample size of 250.

3.2. Testing the reliability of scales

This study uses the Cronbach alpha (CA) analysis to determine the reliability of the valid variables for the scales (including creativity, self-confidence, personal energy, risk propensity, leadership ability, and ambiguous problem solving) as well as innovation capacity. The results are in Table 2. Because all coefficients of CA are higher than 0.7 and the values of corrected item-total correlation are higher than 0.4, the reliability test stand was reached [29].

Table 2. Reliability of the survey scale.

Factor	Cronbach's alpha	Variables	Corrected item- Total correlation
IC	0.724	IC1	0.540
		IC2	0.558
		IC3	0.439
		IC4	0.524
CR	0.782	CR1	0.374
		CR2	0.646
		CR3	0.660
		CR4	0.601
		CR5	0.517
SC	0.799	SC1	0.642
		SC2	0.576
		SC3	0.595
		SC4	0.631
PE	0.850	PE1	0.664
		PE2	0.661
		PE3	0.630
		PE4	0.707
		PE5	0.636
RP	0.861	RP1	0.632
		RP2	0.732
		RP3	0.750
		RP4	0.719
LD	0.901	LD1	0.719
		LD2	0.765
		LD3	0.763
		LD4	0.737
		LD5	0.740
		LD6	0.655
PS	0.724	PS1	0.540
		PS2	0.558
		PS3	0.439
		PS4	0.524

Source: Authors' calculation from the survey results "Determining factors affecting innovation capacity of students at economic universities in Hanoi" with sample size of 250.

3.3. Exploratory factor analysis

After analysing Cronbach's alpha, six factors (independent variables) with 32 observed variables, were included for exploratory factor analysis (EFA). From Table 3, the KMO test coefficient calculated from the sample was $0.893 < 1.0$. Thus, the sample size of the survey was eligible to conduct EFA. Bartlett's Test of Sphericity was significant with $P\text{-value} = 0.00$. This value indicates that the observed variables are correlated concerning the total number of observations.

Table 4 shows that 6 factors explain 65.903% ($>50\%$) of the variation of the data set. All observed variables in the table have a factor loading of 0.5. Therefore, the independent variables in the research model have convergent and discriminant values.

Table 3. KMO and Bartlett's test.

Kaiser-Meyer-Olkin measure of sampling adequacy		0.893
Bartlett's test of sphericity	Approx. Chi-square	3276.778
	Df	351
	Sig.	0.000

Source: Authors' calculation from the survey results "Determining factors affecting innovation capacity of students at economic universities in Hanoi" with sample size of 250.

Table 4. Total variance explained.

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	8.387	31.063	31.063	8.387	31.063	31.063
2	2.647	9.802	40.865	2.647	9.802	40.865
3	2.192	8.117	48.982	2.192	8.117	48.982
4	1.826	6.762	55.744	1.826	6.762	55.744
5	1.544	5.717	61.461	1.544	5.717	61.461
6	1.199	4.442	65.903	1.199	4.442	65.903
7	0.848	3.141	69.044			
8	0.683	2.529	71.573			
9	0.661	2.447	74.020			
10	0.611	2.263	76.283			
11	0.588	2.177	78.459			
12	0.543	2.009	80.469			
13	0.538	1.994	82.462			
14	0.485	1.796	84.259			
15	0.458	1.695	85.954			
16	0.413	1.529	87.483			
17	0.391	1.450	88.933			
18	0.374	1.387	90.320			
19	0.365	1.353	91.673			
20	0.337	1.250	92.923			
21	0.331	1.224	94.147			
22	0.315	1.167	95.314			
23	0.293	1.084	96.398			
24	0.280	1.036	97.434			
25	0.266	0.985	98.419			
26	0.230	0.852	99.271			
27	0.197	0.729	100.000			

Source: Authors' calculation from the survey results "Determining factors affecting innovation capacity of students at economic universities in Hanoi" with sample size of 250.

3.4. Correlation analysis

Table 5 shows a linear correlation between the independent and dependent variables because the value of the P-value is less than 5%. In addition, the Pearson coefficient between these variables is positive, indicating a positive relationship. This means that the increase in the value of the independent variable increases the value of the dependent variables.

Table 5. Rotation component matrix-measuring scales of factors.

Variables	Component					
	1	2	3	4	5	6
CR2	0.821					
CR3	0.830					
CR4	0.773					
CR5	0.718					
LD1		0.747				
LD2		0.818				
LD3		0.796				
LD4		0.794				
LD5		0.775				
LD6		0.667				
SC1			0.665			
SC2			0.789			
SC3			0.641			
SC4			0.714			
PE1				0.698		
PE2				0.695		
PE3				0.670		
PE4				0.700		
PE5				0.769		
RP1					0.713	
RP2					0.812	
RP3					0.843	
RP4					0.834	
PS1						0.698
PS2						0.734
PS3						0.659
PS4						0.792

Source: Authors' calculation from the survey results "Determining factors affecting innovation capacity of students at economic universities in Hanoi" with sample size of 250.

3.5. Regression analysis

Sig parameter (2-tailed) of the independent variables compared with the dependent variable are all less than 0.05, so the independent variables are all correlated with the dependent variable. Regarding the Pearson correlation, the higher the parameter, the higher the correlation. Therefore, the variable personal energy has the strongest correlation with the variable innovation capacity of students (0.701). Ranked second is the leadership ability variable with a parameter of 0.696. Ranked third is self-confidence with a parameter of 0.615. Ranked fourth is ambiguous problem solving with a parameter of 0.582. Fifth place is risk propensity with 0.561 and finally creativity with 0.155. The results are presented in Table 6.

Table 6. Correlations between the independent variable and dependent variables.

		CR	LD	SC	PE	RP	PS	IC
CR	Pearson correlation	1	-0.019	0.044	0.068	-0.051	0.005	0.155*
	Sig. (2-tailed)		0.763	0.491	0.286	0.423	0.937	0.014
	N	250	250	250	250	250	250	250
LD	Pearson correlation	-0.019	1	0.450**	0.512**	0.357**	0.452**	0.696**
	Sig. (2-tailed)	0.763		0.000	0.000	0.000	0.000	0.000
	N	250	250	250	250	250	250	250
SC	Pearson correlation	0.044	0.450**	1	0.577**	0.355**	0.379**	0.615**
	Sig. (2-tailed)	0.491	0.000		0.000	0.000	0.000	0.000
	N	250	250	250	250	250	250	250
PE	Pearson correlation	0.068	0.512**	0.577**	1	0.370**	0.494**	0.701**
	Sig. (2-tailed)	0.286	0.000	0.000		0.000	0.000	0.000
	N	250	250	250	250	250	250	250
RP	Pearson correlation	-0.051	0.357**	0.355**	0.370**	1	0.375**	0.561**
	Sig. (2-tailed)	0.423	0.000	0.000	0.000		0.000	0.000
	N	250	250	250	250	250	250	250
PS	Pearson correlation	0.005	0.452**	0.379**	0.494**	0.375**	1	0.582**
	Sig. (2-tailed)	0.937	0.000	0.000	0.000	0.000		0.000
	N	250	250	250	250	250	250	250
IC	Pearson correlation	0.155*	0.696**	0.615**	0.701**	0.561**	0.582**	1
	Sig. (2-tailed)	0.014	0.000	0.000	0.000	0.000	0.000	
	N	250	250	250	250	250	250	250

Source: Authors' calculation from the survey results "Determining factors affecting innovation capacity of students at economic universities in Hanoi" with sample size of 250.

Table 7. Model summary.

Model	R	R square	Adjusted R square	Std. Error of the estimate	Durbin-Watson
1	0.873 ^a	0.762	0.757	0.25452	1.976
^a : Independent variable: (Constant) CR, SC, LD, PE, RP, PS					

Table 7 shows the level of explanation of the model, it can be seen that the adjusted R2 index is 0.757, which means that 75.7% of the change in capacity is explained by the impact of 6 independent variables (CR, SC, LD, PE, RP, PS).

Table 8. Coefficients.

Model	Unstandardised coefficients		Standardised coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.010	0.164		0.058	0.954
CR	0.109	0.023	0.148	4.695	0.000
LD	0.244	0.028	0.339	8.726	0.000
SC	0.156	0.038	0.165	4.147	0.000
PE	0.208	0.034	0.262	6.114	0.000
RP	0.168	0.025	0.236	6.652	0.000
PS	0.128	0.033	0.148	3.892	0.000

Source: Authors' calculation from the survey results "Determining factors affecting innovation capacity of students at economic universities in Hanoi" with sample size of 250.

It can be seen in Table 8 that personal energy is considered to be the strongest influence on students' innovation capacity. This shows that students in the economic sector in Hanoi have positive and abundant resources. This can provide a few hypotheses such as a favourable learning environment, teachers creating favourable conditions for students to develop, and neither forcing nor creating stereotypes. Not only that, but the family environment can also create conditions for children to develop, freely choose according to the framework, and create other environments such as clubs and jobs to help students develop and have the ability to self-motivation to overcome difficulties.

Next, the leadership ability of students also has a strong influence on innovation capacity. The

university environment of economics students in Hanoi with group exercises, class, or club activities encourages students to engage and choose leadership positions. In a leadership position, the responsibility will certainly be higher regarding having to think about and make innovative decisions to lead the development team. In addition, with the dynamism of economics students in Hanoi, they will tend to want to lead others so that they can experience a great development from which their ability to innovate will develop accordingly.

Self-confidence, ambiguous problem solving, or risk propensity is only in the latter group, affecting students' innovation ability because confidence can be caused by a low level of confidence. Therefore, it has not had a strong impact on the innovation capacity of students. As for the students' ability to solve complex problems, the skill is still low because the level of practice is not high, mainly because the learning environment stops at theory. Regarding the level of risk propensity, it is because economics students in particular and Vietnamese people in general have a low level of risk propensity that the results are different from Western countries because the certainty in thinking from the past also affects today.

Finally, the creative variable has the lowest influence on students' innovation capacity because students are still studying in theory and have less opportunities to improve their creativity. There are few challenges for students to change and be creative. Therefore, with so much academic scholarship, it is understandable that creativity has the least influence on the innovation capacity of economics students in Hanoi.

4. Conclusions

As the country's digital transformation has changed the way we live and work, businesses need to strengthen their innovation capabilities. Innovation is a must for today's business to remain competitive. In addition, innovation is also considered the "key"

to recovering the post-COVID-19 economy. It can be said that it has become an objective factor, a basis, a driving force, and a way for businesses to survive and develop in the context of economic integration and increasingly fierce competition. Therefore, students who are the future high-quality workforce of businesses and organizations also need to equip and train themselves with a very good creative and innovative capacity.

The objective of this study is to provide an overview of student innovation and the factors influencing this capacity. The study successfully clarified and systematized the theory of innovation in general and innovation capacity of students in particular as well as established equations and built correlation models of the influence of 6 factors on students' innovation capacity. At the same time, this study analysed the 6-factor model to clarify and evaluate the influence of 6 factors: personal energy, risk propensity, leadership ability, ambiguous problem solving, self-confidence and creativity to the innovative capacity of students.

Based on the research results, the authors have proposed a number of solutions to improve students' innovation capacity such as: increasing extracurricular activities outside the classroom (volunteer programs, groups, quizzes, academic, talented, etc.); implement new teaching methods that encourage students to voice their opinions and personal thoughts on the topic of the lesson; organize many creative contests, and create a healthy playground for students to practice and express their personal creativity.

CRediT author statement

Dieu Linh Ha: Conceptualisation, Methodology, Formal analysis, Writing, Editing; Thi My Linh Nguyen: Methodology, Writing; Van Hoang Nguyen: Data analysis; Gia Huy Tran: Data analysis, Writing; Duc Kien Nguyen, Khanh Huyen Trinh: Writing.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] R.A. Beghetto, J.C. Kaufman (2014), "Classroom contexts for creativity", *High Ability Studies*, **25**(1), pp.53-69, DOI: 10.1080/13598139.2014.905247.
- [2] E. Chell, R. Athayde (2009), *The Identification and Measurement of Innovative Characteristics of Young People: Development of The Youth Innovation Skills Measurement Tool*, Nesta, Kingston University Publishing, pp.9-17.
- [3] J. Schumpeter (1934), "The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle", *Harvard Economic Studies Series*, **46**, <https://ssrn.com/abstract=1496199>, accessed 15 November 2022.
- [4] A. Afuah (2012), *Managing The Process of New and Creative Change*, National Economics University Publishing, pp.25-37.
- [5] S. Kline, N. Rosenberg (2009), *Studies on Science and The Innovation Process*, World Scientific Publishing, pp.1-35, DOI: 10.1142/7306.
- [6] P. Fan (2010), "Innovation capacity and economic development: China and India", *Economic Change and Restructuring*, **44**, pp.49-73, DOI: 10.1007/s10644-010-9088-2.
- [7] L. Klerkx, A.J. Hall, C. Leeuwis (2009), "Strengthening agricultural innovation capacity: Are innovation brokers the answer?", *International Journal of Agricultural Resources, Governance and Ecology*, **8**(5-6), pp.409-438, DOI: 10.1504/IJARGE.2009.032643.
- [8] R. Rohrbeck, H.G. Gemuenden (2011), "Corporate foresight: Its three roles in enhancing the innovation capacity of a firm", *Technological Forecasting and Social Change*, **78**(2), pp.231-243, DOI: 10.1016/j.techfore.2010.06.019.
- [9] T. Koc (2007), "Organizational determinants of innovation capacity in software companies", *Computers & Industrial Engineering*, **53**(3), pp.373-385, DOI: 10.1016/j.cie.2007.05.003.
- [10] J. Ferreira, C.I. Fernandes, M.L. Raposo (2017), "The effects of location on firm innovation capacity", *Journal of the Knowledge Economy*, **8**, pp.77-96, DOI: 10.1007/s13132-015-0281-4.
- [11] J.M. Lewis, L.M. Ricard, E.H. Klijn, et al. (2018), "How innovation drivers, networking and leadership shape public sector innovation capacity", *International Review of Administrative Sciences*, **84**(2), pp.288-307, DOI: 10.1177/0020852317694085.
- [12] D. Cropley, A. Cropley (2017), "Innovation capacity, organisational culture and gender", *European Journal of Innovation Management*, **20**(3), pp.493-510, DOI: 10.1108/EJIM-12-2016-0120.

- [13] D.H. Jonassen (1994), "Thinking technology: Toward a constructivist design model", *Educational Technology*, **34(4)**, pp.34-37.
- [14] M.M. Keinänen, L.K. Mertanen (2019), "Researching learning environments and students' innovation competences", *Education + Training*, **11**, DOI: 10.1108/ET-03-2018-0064/full/html.
- [15] R. Barnett (1992), "The idea of quality: Voicing the educational", *Higher Education Quarterly*, **46(1)**, pp.3-19, DOI: 10.1111/j.1468-2273.1992.tb01581.x.
- [16] F.E. Weinert (2001), "Concept of competence: A conceptual clarification", *APA PsycNet*, **1**, pp.45-65.
- [17] A.R. Ovbiagbonhia, B. Kollöffel, P.D. Brok (2019), "Educating for innovation: Students' perceptions of the learning environment and of their own innovation competence", *Learning Environments Research*, **22**, pp.387-407, DOI: 10.1007/s10984-019-09280-3.
- [18] P. Tierney, S.M. Farmer (2002), "Creative self-efficacy: Its potential antecedents and relationship to creative performance", *Academy of Management Journal*, **45(6)**, pp.1137-1148, DOI: 10.2307/3069429.
- [19] T. Kelley, D. Kelley (2013), *Creative Confidence: Unleashing The Creative Potential Within Us All*, The Crown Publishing Group, pp.132-156.
- [20] S.T. Hunter, L. Cushenbery, T. Friedrich (2012), "Hiring an innovative workforce: A necessary yet uniquely challenging endeavor", *Human Resource Management Review*, **22(4)**, pp.303-322, DOI: 10.1016/j.hrmr.2012.01.001.
- [21] K. Robinson (2011), *Out of Our Mind*, West Sussex: Capstone Publishing, pp.245-283.
- [22] F. Tabak, S.H. Barr (1999), "Propensity to adopt technological innovations: The impact of personal characteristics and organizational context", *Journal of Engineering and Technology Management*, **16(3-4)**, pp.247-270, DOI: 10.1016/S0923-4748(99)00011-9.
- [23] J.H. Dyer, H. Gregersen, C.M. Christensen (2009), "The innovator's DNA", *Harvard Business Review*, **87(12)**, pp.60-67.
- [24] J.M. Burn (1996), "Is innovation and organizational alignment - A professional juggling act", *Journal of Information Technology*, **11(1)**, pp.3-12, DOI: 10.1177/026839629601100101.
- [25] E. Chell (2001), *Entrepreneurship: Globalisation, Innovation and Development*, Kingston University London pp.350-400.
- [26] P. Witt (1998), "Strategies of technical innovation in Eastern European firms", *Management International Review*, **5**, pp.161-182.
- [27] R.T. Keller (2012), "Predicting the performance and innovativeness of scientists and engineers", *Journal of Applied Psychology*, **97(1)**, pp.225-233, DOI: 10.1037/a0025332.
- [28] J.F. Hair, R. Anderson, R. Tatham, et al. (1998), "Multivariate data analysis", *Scientific Research*, **5(3)**, pp.207-219.
- [29] J.R. Hair, J.M. Sarstedt, L.M. Matthews, et al. (2016), "Identifying and treating unobserved heterogeneity with FIMIX-PLS: Part I - method", *European Business Review*, **28(1)**, pp.63-76, DOI: 10.1108/EBR-09-2015-0094.

Factors affecting customers' satisfaction on mobile banking service quality at Asia Commercial Joint Stock Bank

Tran Minh Hieu^{1, 2, 3*}, Le Phuoc Huy⁴

¹University of Economics and Law, Vietnam National University - Ho Chi Minh City, No. 669, Highway 1, Quarter 3, Linh Xuan Ward, Thu Duc City, Ho Chi Minh City, Vietnam

²An Giang University, 18 Ung Van Khiem Street, Dong Xuyen Ward, Long Xuyen City, An Giang Province, Vietnam

³Vietnam National University - Ho Chi Minh City, Linh Trung Ward, Thu Duc City, Ho Chi Minh City, Vietnam

⁴Asia Commercial Joint Stock Bank, An Giang Branch, 95 Nguyen Trai Street, My Long Ward, Long Xuyen City, An Giang Province, Vietnam

Received 28 December 2022; revised 1 March 2023; accepted 21 March 2023

Abstract:

This study examined the factors affecting customer satisfaction on the quality of mobile banking services at commercial banks like the Asia Commercial Joint Stock Bank (ACB). The model of A.P. Parasuraman, et al. (1988) [1] was applied as the theoretical background for this study. Measurement scale was validated with Cronbach's alpha, exploratory factor analysis (EFA). The results show that tangibles, reliability, and competency affect customers' satisfaction with mobile banking service quality. Some managerial implications were grasped: (i) it is necessary to update many utility functions to serve customers' need; (ii) it would be helpful to optimize the customer service process for quickness and accuracy; (iii) banking staff need to be equipped with more knowledge and skills to create a sense of trust while dealing with customers; (iv) Clear, complete, and simple information on transaction terms are required to commit that the information is the most accurate and true to give customers a feeling of peace of mind when doing transactions; and (v) Appropriate compensation policies are essential to create employee satisfaction so that employees can work effectively and productively.

Keywords: Asia Commercial Joint Stock Bank, customer satisfaction, mobile banking, reliability, service capacity, tangible means.

Classification number: 2.2

1. Introduction

In the 4.0 revolution, information technology has penetrated every aspect of social life, regardless of the field or industry. Indeed, information technology has been applied to banks, too. In order to meet the rising needs of customers, banks have also been applying information technology to banking activities with services such as internet banking, mobile banking, or SMS banking. According to the research results about e-banking market in Vietnam in January 2021 [2], there are now more than 120 million mobile subscribers in Vietnam with more than 75% able to register for mobile banking and online payment services. This is a springboard for the development of e-banking technology and is considered as a top priority mobile platform.

The benefits of mobile banking for users are many, for example, it provides many convenient services to help users avoid visiting bank branches directly while still being able to perform basic transactions such as money transfers, bill payments (air tickets, electricity bills), registration for opening cards, or online savings books.

To bring extremely valuable experiences to customers, ACB has been catching up with the development trend of integrating itself in many applications such as ACB One and ACB Business.

In order to improve customer experience and service quality when using ACB's mobile banking, it is critical to research, survey, and evaluate customer satisfaction to identify the factors affecting customer satisfaction on the quality of mobile banking services.

*Corresponding author: Email: hieutm18707@sdh.uel.edu.vn

The results of this research suggest recommendations to help ACB improve service quality, increase user experience, and increase ACB's competitive advantage in the financial and banking market.

2. Theory

2.1. Overview of service

According to P. Kotler (2003) [3], service is any action and result that one party can provide to another that is essentially intangible and does not result in ownership of something. Its product may or may not be tied to a physical product.

V.A. Zeithaml, et al. (2000) [4] defined services are behaviours, processes, and ways of doing something to create value for customers.

Meanwhile, N.H. Khai, et al. (2007) [5] believed that services are special products with many characteristics different from other goods. These characteristics may make services difficult to quantify and unrecognizable to the naked eye. The four basic characteristics of services are: intangibility, inhomogeneity, instorability, and inseparability.

2.2. Overview of service quality

A.P. Parasuraman, et al. (1988) [1], (1985) [6] said that service quality is the gap between customers' expectations and their perceptions when using the service. The above definition of Parasuraman is widely accepted by scientists and businesspeople and is used in research as well as in real business.

Based on the research of N.T.T. Loan, et al. (2011) [7], service quality has outstanding characteristics such as: superiority, product specificity, supply ability, and satisfaction of needs.

2.3. Overview of e-banking services

2.3.1. The concept of e-banking

According to T. Dube, et al. (2009) [8], electronic banking is a service that allows a bank's customers to access their accounts, receive the latest information about the bank and its products and services, and perform all financial transactions anytime and anywhere through the use of the bank's website.

N.H. Quan (2020) [9] explained that e-banking includes a series of banking transactions where customers can make transactions via electronic means

without having to visit branches. One advantage of electronic banking over traditional banking is the ability to automatically record transactions.

2.3.2. The concept of mobile banking service

Mobile banking is an innovative communication channel in which customers interact with the bank via mobile devices [10-12]. However, the dynamic market for mobile banking shows the need for a new definition to capture recent advances in the field.

Meanwhile, A.A. Shaikh, et al. (2015) [13] defined mobile banking is a product or service provided by a bank or microfinance institute for financial and non-financial transactions with mobile devices, specifically, mobile phones, smartphones, or tablets.

2.4. Customer satisfaction and the relationship between service quality and customer satisfaction

Customer satisfaction is the level of a person's sensory state resulting from comparing the results obtained from consuming a product or service with the customer's expectations [14].

O.C. Hansemark, et al. (2004) [15] said that customer satisfaction is the overall attitude of a customer towards a service provider, or emotional response to the difference between what the customer anticipates and what the customer expects or what they receive for the fulfilment of some need, goal, or want.

According to S. Thongsamak (2001) [16], customer satisfaction and service quality are two separate but related constructs. Service quality is an objective and cognitive concept, while satisfaction is a combination of subjective components that is based on feelings and emotions. Service quality is the most influential factor on customer satisfaction [17-19].

In addition, it is important to determine how the use of a mobile banking financial system could contribute to banks in term of customer satisfaction [20]. Some factors such as relative advantages, satisfaction, and trust have the most significant impact on customer loyalty [21]. Beside these, cloud services, security, e-learning, and service quality are four significant factors influencing customer satisfaction in using Internet banking services [22].

2.5. Research model of service quality

2.5.1. *Model SERVQUAL* Valarie Zeithaml, A. Parasuraman and Leonard Berry in 1988

The SERVQUAL model, also known as the five service quality improvement gap model, is a scale that captures and measures the service quality that customers have experienced. This model was developed and implemented by American experts in 1988 [1].

This model includes the following factors: responsiveness, service capability, approach, politeness, communication, credibility, safety, customer understanding, and tangible factors.

2.5.2. *Parasuraman and Malhotra's E-SERVQUAL model 2005*

A.P. Parasuraman, et al. (2005) [23] pointed out that customers' evaluation of website quality includes not only their experience during their interactions with the website, but also the service after their interactions (i.e., fulfilment and profit). Thus, the E-SERVQUAL model is generally defined to include all stages of a customer's interaction with a website, for example, the extent to which a website facilitates shopping, purchasing, and shipping. This model includes the following factors: reliability, responsiveness, access, flexibility, ease of navigation, efficiency, assurance/trust, security/privacy, price knowledge, website aesthetics, and customization/personalization.

3. Research process and research model

3.1. Research process

Preliminary research (qualitative research) was carried out for the purpose of establishing and completing the questionnaire. The study was conducted through a direct survey of customers who have used or currently use mobile banking at ACB.

In-depth interviews included questions based on theory and practical information in order to discover more information around the research topic. After completing the questionnaire, it was evaluated for reasonableness, then adjusted and perfected.

A formal survey called "Factors affecting customer satisfaction about the quality of mobile banking services at Asia Commercial Joint Stock Bank" was conducted with the completed questionnaire. The collected data was cleaned, coded, and analysed through SPSS software.

3.2. Research model and hypotheses (Fig. 1)

Hypothesis H1: Tangibles have a positive relationship with customer satisfaction on the quality of mobile banking services.

Hypothesis H2: Reliability has a positive relationship with customer satisfaction on the quality of mobile banking services.

Hypothesis H3: The level of responsiveness has a positive relationship with customer satisfaction on the quality of mobile banking services.

Hypothesis H4: Service capacity has a positive relationship with customer satisfaction on the quality of mobile banking services.

Hypothesis H5: The level of empathy has a positive relationship with customer satisfaction on the quality of mobile banking services.

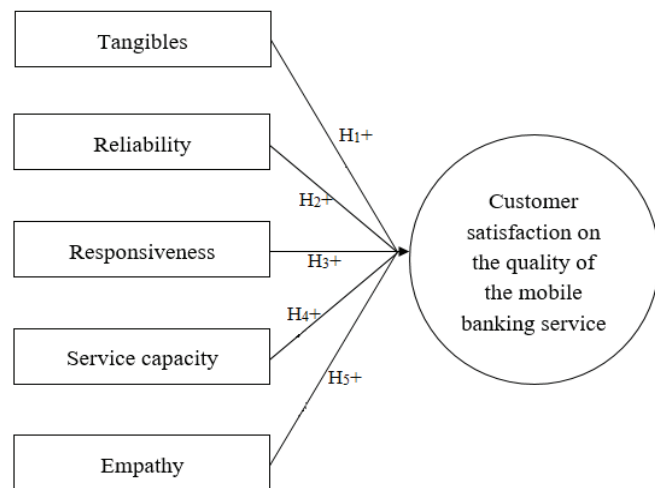


Fig. 1. The research model.

4. Results

The survey was conducted in over the period from February to April 2022 and implemented through the distribution of questionnaires directly to customers who have been or are currently using ACB's mobile banking service. As a result, there were

181 satisfactory surveys from the 200 questionnaires distributed. The data was analysed and the results reported.

4.1. Reliability test results by Cronbach's alpha (Table 1)

Table 1. Cronbach's alpha results.

Numerical order	The scale	Number of observed variables	Cronbach's alpha
1	Tangible	05	0.716
2	Reliability	05	0.804
3	Responsiveness	05	0.865
4	Service capacity	04	0.806
5	Empathy	05	0.782
6	Customer satisfaction	05	0.767

Source: Survey "Factors affecting customer satisfaction about the quality of mobile banking services at Asia Commercial Joint Stock Bank" in 2022.

After completing the scale test using Cronbach's alpha coefficient, the number of observed variables remaining were 24, keeping 5 independent variables unchanged (tangible, reliability, responsiveness, service capacity, empathy) and the dependent variable (customer satisfaction).

4.2. Exploratory factor analysis (EFA) results

4.2.1. EFA analysis of independent variables

Table 2. List of coefficients.

Coefficient	Value
KMO	0.827
Sig. Bartlett's test	0.000

The coefficient of KMO in the analysis was $0.827 > 0.5$, showing that the factor analysis results were appropriate (Table 2).

Bartlett's test has a sig. coefficient of $0.000 < 0.05$, showing that the results of factor analysis possessed statistical significance.

With eigenvalues of $1.008 > 1$, exploratory factor analysis (EFA) extracted 5 factors from 21 observed variables with a total extracted variance of

$63.871\% > 50\%$ (satisfactory), that is, 5 factors from the above factors extracted 63.871% of the variance of the observed variables.

Table 3. Exploratory factor analysis results.

	Factor				
	1	2	3	4	5
TC04	0.801				
TC03	0.774				
TC02	0.762				
TC05	0.702				
TC01	0.654				
DU05		0.787			
DU01		0.763			
DU02		0.730			
DU03		0.653			
NL04			0.725		
NL02			0.724		
NL01			0.686		
NL03			0.632		
HH05				0.784	
HH01				0.784	
HH04				0.733	
HH03				0.696	
DC05					0.760
DC02					0.755
DC01					0.669
DC03					0.542

Source: Survey "Factors affecting customer satisfaction about the quality of mobile banking services at Asia Commercial Joint Stock Bank" in 2022.

After conducting exploratory factor analysis (EFA), there were 5 groups of factors extracted from the model (Table 3):

+ Factor 1: Including 5 observed variables: TC01, TC02, TC03, TC04, TC05, the name reliability is retained, and the symbol is TC.

+ Factor 2: Including 4 observed variables: DU01, DU02, DU03, DU05, the name response is kept, and the symbol is DU.

+ Factor 3: Including 4 observed variables: NL01, NL02, NL03, NL04, the name capacity is kept, and the symbol is NL.

+ Factor 4: Including 4 observed variables: HH01, HH03, HH04, HH05, the name is kept tangible, and denoted HH.

+ Factor 5: Including 4 observed variables: DC01, DC02, DC03, DC05, the name is empathy kept, and the symbol is DC.

4.2.2. Results of dependent variable analysis (Table 4)

The KMO coefficient in the analysis was $0.728 > 0.5$, showing that the factor analysis results were appropriate.

Bartlett's test had a sig. coefficient of $0.000 < 0.05$, showing that the results of factor analysis ensured statistical significance.

The eigenvalue coefficient of the satisfaction factor was $2.592 > 1$ and the extracted variance was $51.843\% > 50\%$. Thus, the extracted variance met the requirements.

Table 4. Dependent variable analysis results.

Observed variables	Factor 1
HL03	0.766
HL02	0.747
HL05	0.732
HL01	0.698
HL04	0.652

Source: Survey "Factors affecting customer satisfaction about the quality of mobile banking services at Asia Commercial Joint Stock Bank" in 2022.

4.3. Correlation analysis results (Table 5)

Considering the correlation between the dependent variables and independent variables, it was shown that there was a correlation between the dependent variable customer satisfaction and the independent variables. Specifically, the correlation between satisfaction (HL) with trust was ($r=0.181$), with response was ($r=0.111$), with competence was ($r=0.437$), with tangible means was ($r=0.602$), and with empathy was ($r=0.120$).

Sig. coefficient: The Pearson correlation of independent variables TC, NL, and HH with the dependent variable HL was less than 0.05. Thus,

there was a linear relationship between these independent variables and the satisfaction variable.

Sig. coefficient: The Pearson correlation of independent variables DU and DC with dependent variable HL is greater than 0.05. Thus, there was no linear relationship between these independent variables and the satisfaction variable.

The independent variables were not correlated with each other because $\text{Sig.} = 1.000 > 0.05$, so the model does not have multicollinearity.

Table 5. Correlation coefficients.

	TC	DU	NL	HH	DC	SHL
Sig. (2-tailed)	TC	1.000	1.000	1.000	1.000	0.015
	DU	1.000	1.000	1.000	1.000	0.138
	NL	1.000	1.000	1.000	1.000	0.000
	HH	1.000	1.000	1.000	1.000	0.000
	DC	1.000	1.000	1.000	1.000	0.108
	SHL	0.015	0.138	0.000	0.000	0.108

Source: Survey "Factors affecting customer satisfaction about the quality of mobile banking services at Asia Commercial Joint Stock Bank" in 2022.

4.4. Regression analysis

Table 6. Model summary.

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	Durbin-Watson
1	0.766 ^a	0.586	0.579	0.64848853	2.051

An adjusted R^2 of 0.579 shows that 57.9% of the variation in customer satisfaction in banking services is explained by the three independent variables TC, NL, and HH included in the model (Table 6).

Table 7. Regression results.

Model	Beta	Std. Error	Standardized Coefficients Beta	t	Sig.	VIF
1	Constant	4.072E-16	0.048	0.000	1.000	
	TC	0.181	0.048	3.735	0.000	1.000
	NL	0.437	0.048	9.050	0.000	1.000
	HH	0.602	0.048	12.457	0.000	1.000

Source: Survey "Factors affecting customer satisfaction about the quality of mobile banking services at Asia Commercial Joint Stock Bank" in 2022.

Considering the table of regression weights, the β weights of these variables are statistically significant (Sig.=0.00<0.05). Therefore, variables HH, TC, and NL had an impact on the variable HL.

Regression equation: $HL = 0.602HH + 0.437NL + 0.181TC$

Thus, it can be concluded that the theoretical model fitted the data. The results showed that there are three independent variables that have a significant impact on the dependent variable (Sig.<0.05) (Table 7).

5. Conclusions and recommendations

5.1. Conclusions

The objective of this study was to analyse the factors affecting customer satisfaction on the quality of mobile banking services at ACB.

The results of Cronbach's alpha test and exploratory factor analysis (EFA) showed the research model has 5 factors: tangible means (HH), service capacity (NL), and reliability (TC), empathy (DC), and responsiveness (DU). Thereby, it shows that the initial research model is appropriate.

Next, from the above test results, the author analysed their correlation. After analysis, the model was left with only three groups of factors: tangible means (HH), service capacity (NL), and reliability (TC). This is because the response (DU) and empathy (DC) groups had a sig. coefficient > 0.05.

One-way ANOVA and the independent t-test were conducted to compare the difference in customer evaluations according to 6 demographic variables: gender, education level, occupation, income level, time of communication/translation, and transaction level. The results of testing in customer satisfaction show that there is no difference in satisfaction for the above 6 demographic groups.

5.2. Recommendations

5.2.1. For tangible media

Tangible means had the strongest impact on customer satisfaction ($\beta=0.602$). Research results show that customers are satisfied with the tangible means of mobile banking service quality at ACB. In particular, modern facilities will be highly appreciated by customers.

However, in order to achieve higher customer satisfaction, ACB needs to maintain and focus on investing and improving mobile banking such as arranging its presentation in a more scientific and attractive way, integrating new functions, becoming more convenient and easier to recognize, and creating a more modern and advanced system.

In addition, the attire worn by those that support this department should be neat and polite, which also contributes to customer satisfaction when transacting. ACB needs to improve the design of their application interface to be simpler and easier to understand while making it easier for new and existing customers to use even if they are not tech-savvy.

Moreover, ACB needs to design appropriate, intuitive icons with service functions for customers that are easily distinguished and usable. In addition, it is necessary to update many utility functions to serve the basic, daily needs of its customers.

5.2.2. For service capacity

Service capacity has the second strongest impact on customer satisfaction ($\beta=0.437$). According to the research results, customers are satisfied with the service capacity of ACB.

In order to further improve customer satisfaction, ACB needs to regularly organize professional training courses for employees to help equip them with the knowledge and skills to best serve customers.

From there, it would be helpful to optimize the customer service process for quickness and accuracy.

In addition, the Board of Directors should have appropriate compensation policies in place to create employee satisfaction so that employees can work effectively and productively.

5.2.3. For reliability

Reliability had the third strongest impact on customer satisfaction ($\beta=0.181$). According to the research results, customers are satisfied with the reliability of ACB. When transacting, customers felt that their information was kept confidential and safe.

In addition, ACB needs to provide clear, complete, and simple information on transaction terms, committing that this information is the most accurate

and true to give customers a feeling of peace of mind when transacting.

Besides these recommendations, ACB needs to promote their brand more widely in order to increase brand recognition, trust, and satisfaction in the bank from its customers.

Finally, employees also need to be equipped with more knowledge and skills to create a sense of trust while dealing with customers.

CRediT author statement

Tran Minh Hieu: Methodology, Research model, Research scales, Writing - Original draft preparation, Reviewing; Le Phuoc Huy: Reviewing, Surveying data, Analysing results, Writing.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] A.P. Parasuraman, V.A. Zeithaml, L.L. Berry (1988), "SERVQUAL: A multiple item scale for measuring consumer perception of service quality", *Journal of Retailing*, **64**(1), pp.12-40.
- [2] Mibrand (2021), "Research results on Vietnam e-banking market january 2021", <http://mibrand.vn/we-share/ket-qua-nghien-cuu-ve-thi-truong-e-banking-viet-nam-thang-12021>, accessed 17 August 2022 (in Vietnamese).
- [3] P. Kotler (2003), *Customer Relationship Management*, Prentice Hall, 738pp.
- [4] V.A. Zeithaml, M.J. Bitner (2000), *Services Marketing: Integrating Customer Focus Across the Firm*, Irwin McGraw-Hill, 620pp.
- [5] N.H. Khai, V.T. Hien (2007), *Vietnam's Service Industries: Competitiveness and International Economic Integration*, Statistical Publishing House, 335pp (in Vietnamese).
- [6] A.P. Parasuraman, V.A. Zeithaml, L.L. Berry (1985), "A conceptual model of service quality and its implications for future research", *Journal of Marketing*, **49**, pp.44-50, DOI: 10.1177/002224298504900403.
- [7] N.T.T. Loan, P.K.P. Hoang (2011), "Research on improving customer satisfaction using services at Agribank Vietnam - Binh Duong province branch", *Master's Thesis in Economics*, University of Economics Ho Chi Minh City, 66pp (in Vietnamese).
- [8] T. Dube, C. Tofara, R. Langton (2009), "Adoption and use of internet banking in Zimbabwe: An exploratory study", *Journal of Internet Banking and Commerce*, **14**(1), pp.1-13.
- [9] N.H. Quan (2020), "Factors affecting the satisfaction of e-banking service quality: A study at Tien Phong Commercial Bank", *Journal of International Economics and Management*, **125**, pp.29-43 (in Vietnamese).
- [10] U. Akturan, N. Tezcan (2012), "Mobile banking adoption of the youth market: Perceptions and intentions", *Marketing Intelligence & Planning*, **30**(4), pp.444-459, DOI: 10.1108/02634501211231928.
- [11] M.N. Masrek, I.E. Khairuddin, N.A. Uzir (2012), "Trust in mobile banking adoption in Malaysia: A conceptual framework", *Journal of Mobile Technologies, Knowledge and Society*, **2012**, DOI: 10.5171/2012.281953.
- [12] K.H. Shih, C.J. Chang, B. Lin (2010), "Assessing knowledge creation and intellectual capital in banking industry", *Journal of Intellectual Capital*, **11**(1), pp.74-89, DOI: 10.1108/14691931011013343.
- [13] A.A. Shaikh, H. Karjaluoto (2015), "Mobile banking adoption: A literature review", *Telematics and Informatics*, **32**(1), pp.129-142, DOI: 10.1016/j.tele.2014.05.003.
- [14] P. Kotler (2001), *Marketing Management*, Pearson Education Canada, 718pp.
- [15] O.C. Hansemark, M. Albinsson (2004), "Customer satisfaction and retention: The experiences of individual employees", *Managing Service Quality: An International Journal*, **14**(1), pp.40-57, DOI: 10.1108/09604520410513668.
- [16] S. Thongsamak (2001), "Service quality: Its measurement and relationship with customer satisfaction", *Journal of Service Marketing*, **14**(1), pp.9-26.
- [17] J.J. Cronin, S.A. Taylor (1992), "Measuring service quality - A reexamination and extension", *Journal of Marketing*, **56**(3), pp.55-68, DOI: 10.2307/1252296.
- [18] U. Yavas, Z. Bilgin, D.J. Shemwell (1997), "Service quality in the banking sector in an emerging economy: A consumer survey", *International Journal of Bank Marketing*, **15**(6), pp.217-223, DOI: 10.1108/02652329710184442.
- [19] A.A. Kemal (2019), "Mobile banking in the government-to-person payment sector for financial inclusion in Pakistan", *Information Technology for Development*, **25**(3), pp.475-502, DOI: 10.1080/02681102.2017.1422105.
- [20] V. Bhatt, D. Nagar (2021), "An empirical study to evaluate factors affecting customer satisfaction on the adoption of mobile banking track: Financial management", *Turkish Journal of Computer and Mathematics Education*, **12**(10), pp.5354-5373, DOI: 10.17762/turcomat.v12i10.5338.
- [21] A. Esmaili, I. Haghighi, V. Davidavi ienê, et al. (2021), "Customer loyalty in mobile banking: Evaluation of perceived risk, relative advantages, and usability factors", *Engineering Economics*, **32**(1), pp.70-81, DOI: 10.5755/j01.ee.32.1.25286.
- [22] F. Li, H. Lu, M. Hou, et al. (2021), "Customer satisfaction with bank services: The role of cloud services, security, e-learning, and service quality", *Technology in Society*, **64**, DOI: 10.1016/j.techsoc.2020.101487.
- [23] A.P. Parasuraman, V.A. Zeithaml, A. Malhotra (2005), "E-S-Qual: A multipleitem scale for assessing electronic service quality", *Journal of Service Research*, **7**(3), pp.213-233, DOI: 10.1177/1094670504271156.

Agricultural cooperatives and climate change adaptation - Case study in Son La, Vietnam

Thi Hai Vu, Thi Diem Hong Phi*, Dang Hoc Nguyen, Quang Trung Tran

Vietnam National University of Agriculture, Trau Quy Town, Gia Lam District, Hanoi, Vietnam

Received 21 December 2022; revised 20 February 2023; accepted 10 March 2023

Abstract:

Adaptation to climate change is an urgent task not only on a national level but for all nations around the world. Within Vietnam, the Son La province has emerged as a successful example of cooperative development. This study aims to confirm the role of agricultural cooperatives in climate change adaptation in order to provide recommendations to cooperative developments as solutions in environmental protection. Based on the concepts of climate change adaptation in updated reports from the Vietnam National Determination Contribution in 2020, this study applies diagnostic and cause-effect analysis to concentrate on highlighting contents and pointing out evidence of Son La cooperatives' roles. The findings show that these cooperatives have significant responsibilities in the orientation of green and safe production, and strongly contribute to reducing negative activities that destroy agricultural ecology. Additionally, cooperatives are also effective actors in linking officers and farmers in the implementation of environmental protections and are leading applicants of solutions for mitigation and adaptation to climate change in rural areas and in agricultural production.

Keywords: Son La agricultural cooperatives, Son La climate change adaptation, Son La cooperatives.

Classification numbers: 2.2, 4.1

1. Introduction

As a result of the Industrial and the challenges and strengths it brought to social economic development, the pursuit of building a sustainable world is becoming a strong focus both nationally and internationally. Climate change is the most urgent concern in the field of sustainability as mentioned by the Intergovernmental Panel on Climate Change (IPCC) co-chair Panmao Zhai: "Climate change is already affecting every region on Earth, in multiple ways. The changes we experience will increase with additional warming [1]". Actually, the average weather conditions and weather variability of a region (or the planet in general) are changing and will continue to change with time. These changes are monitored by variations in temperature, precipitation, wind, storms, and other indicators such as sea level, which are also used to measure climate change. Much of these variations may also change the type, frequency, and intensity of various crop and livestock pests, the availability and timing of irrigation water,

and the severity of soil erosion. In other words, the agricultural sector is one of the most vulnerable sectors to the impacts of climate change [2].

As a managed ecosystem, agricultural systems directly influence production and food supply. Thus, understanding accurate climate change impacts in short and long-term agricultural development is crucial [3]. For example, land degradation, agricultural area loss, low productivity, and air pollution often appear in the short term whereas global threats to food security are long-term threats. Under these conditions, it is necessary to adapt to climate change to reduce damages as well as increase survival.

For suitable pathways, agricultural cooperatives are mentioned as a business form that strongly concerns community and farmer benefits. This is because these cooperatives have been established by farmer groups (e.g., Farmers' Voluntary), including a majority of smallholders at extremely poor or grass-roots levels [4]. The cooperatives serve their members through the following main actions: (a) Supplying farm input

*Corresponding author: Email: ptdhong@vnua.edu.vn

services like seeds, fertilizer, and machinery; (b) Marketing services such as transportation, packaging, distribution, and product marketing; and (c) Credit services to facilitate farming activities [5]. Moreover, agricultural cooperatives can link rural communities with higher scale public and private institutions including governments, development agencies, and agribusiness companies. These partnerships can help limit greenhouse gas emissions from cooperatives and, by their definition, are a possible channel to promote local adaptation and mitigation measures to climate change. Cooperatives are in solidarity with the surrounding community to reduce negative impacts of climate change on people and the environment by following environmental standards and promoting local production and marketing as opposed to long distance transport among consumers and producers. Per the conclusion of the Sustainability Solutions Group (2014), cooperatives represent a systemic solution to global challenges in energy, transportation, housing, retail, employment, and the economy. This indicates that a good solution to confront climate change is through cooperative enterprises [4, 6].

Son La is a mountainous province in northwest Vietnam. Since 2015, Son La's cooperative development has been in the top 10 highest rate of growth by province out of the entire country. The rapid growth of cooperatives, with 192 cooperatives in 2015 to 661 cooperatives in 2020 [7], means that the increasing number of members partially contributes to benefits for farmers as well as adaption to climate change. In legal terms, cooperative development policies are considered a key agenda of not only provincial but also national policies to improve the rural sustainability economy. Recently, at the national level, Resolution No.20-NQ/TW by the 5th National Committee in 2022 confirmed that continued efficiency innovations and cooperative developments that are oriented toward value chains are to be the mainstream of agricultural improvement [8]. In line with the provincial regulation, Resolution No.23-NQ/TU by Son La People Committee enacts that the development of cooperatives directly follows the green economy and circular economy as prioritized in the action plan of Son La [9].

Unfortunately, a preliminary survey shows that most members' motivation for taking part in cooperatives is not to adapt to climate change, not

working together as originally intended. Meanwhile, the agricultural ecosystem has been strongly damaged by climate change in recent decades. According to a report by the Son La Provincial People's Committee (2019), during the last 10 years many flash floods, landslides, and hailstorms occurred causing heavy losses of lives and livelihoods and especially agricultural products. During the period 2018-2019, extreme climate events damaged more than 2,600 hectares of rice; 1,900 ha of maize and crops; more than 1,200 hectares of fruit trees; and dozens of tons of aquatic products that were washed away.

In terms of advancing the cooperative response to climate change by cooperative development, the aim of this study is to find solutions for agricultural cooperative development in Vietnam. Wherein, the following three main objectives are identified: (i) Highlight concepts behind the roles of cooperatives in adapting to climate change; (ii) Point out evidence of cooperatives' attention to environmental concerns in agricultural production; and (iii) Suggest some viewpoints and orientations for farmers/households to become cooperative members to adapt to climate change in Vietnam.

2. Methodology

2.1. Approach description

In this study, prior research in climate change and multiple cooperatives' roles in sustainable development were reviewed as secondary data to collect adapted solutions through cooperative models. This was the background to design the survey/fieldwork in the next steps. The roles of cooperatives in supporting its members for adaptation to climate change in each stage (i.e., input, production, and postharvest) were observed to identify the advantages of the cooperative model in terms of reducing impacts from climate change. Literature such as academic journals or research reports (formal and informal) were gathered from different sources including national and local government offices and available internet data.

In the context of adaptation, a study based on reports from the National Determined Contribution (NDC) at the Conferences of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) was updated and published by the Vietnamese Government in 2020 [10]. Indeed, the

adaptation component is defined as the minimization or reduction of damages from climate change by applying appropriate prevention methods and using efficiency resources.

Moreover, for the purpose of supplying practical evidence for the argument made in this article, participatory action research (PAR) was applied to three cooperatives as emerging study cases in Son La. Interviews were conducted to call attention to the functions/roles of cooperatives in adapting to climate change. Each PAR interview lasted at least 90 min and followed up on specific, academic questions while secondary data were collected mainly during 2020-2021 with partial updated figures done in 2022. Diagnostics and cause-effect analysis were combined to provide findings or recommendations to the local government in cooperative development.

2.2. Framework analysis and limitation (Fig. 1)

With the results of the literature review as a guide, the authors conducted field trips to document evidence of climate change adaptation by the cooperatives in Son La. To verify the findings from prior research, this study collected data and information based on semi-structured questions in PAR interviews of local officers, cooperative members, households, and farmers. Any activities or achievements by the cooperatives to reduce climate change was identified as a contribution to adaption in this model. Consequently, this research's limitation is that any available samples, rather than the quantity of samples, proves the role of cooperatives in climate change.

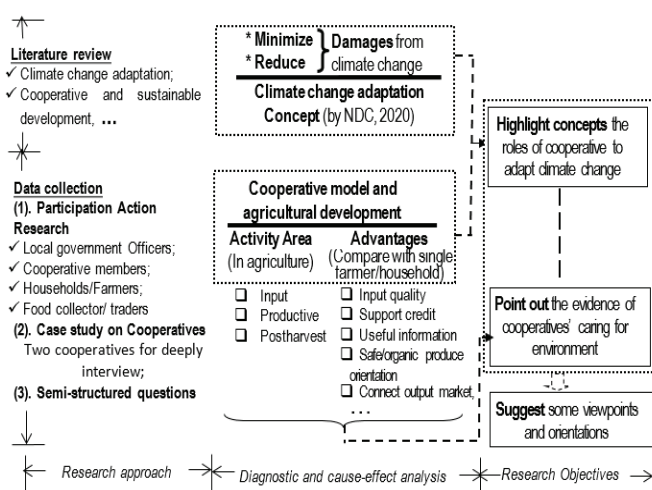


Fig. 1. Research framework analysis.

To compile the evidence, this study documented the authentic situation of three specific cooperatives that were introduced by local officers as having activities that reduce damages made by climate change. These cooperatives are described in the following case boxes to examine the existing roles or action plans that cooperatives use to better climate adaption than an individual household or farm. The concept of a cooperative's role in adapting to climate change is revealed by diagnostic and cause-effect analysis. These results are significant references for issuing recommendations as a part of our research objective.

3. Results

3.1. Climate change situation in Son La province

One of the most obvious aspects of climate change is global warming. In the period of 1986-2020, the average temperature of Son La tended to increase over the whole province. Bac Yen was the lowest average temperature of all districts in Son La. However, over the past 30 years, the average temperature of Bac Yen has increased significantly. The average temperature in Bac Yen in 1986 was 20.5°C and in 2019 and 2020 it was 22.3°C and 21.8°C, respectively. The average temperature in Bac Yen has increased by 1.3-1.8°C during the period of 1986-2020 (Fig. 2). Meanwhile, in Yen Chau, with one of the highest annual average temperature districts in Son La, the average temperature in 1986 was 22.8°C. This number had risen to 24.7°C and 24.4°C in 2019 and 2020, respectively, increasing by 1.9°C and 1.6°C compared to 1986) shown in Fig. 3.

According to the climate change scenario of Son La province (2021), the average temperature will continue to increase into the 21st century. Correspondingly, the average annual temperature of the early 21st century (2015-2035) will increase by 1.64°C (range from 1.15 to 2.00°C). In the middle years of the 21st century (2046-2065), the average temperature will rise by 2.09°C (range between 1.88 and 2.22°C). Finally, at the end of the 21st century (2066-2099), the average temperature will expand by 2.73°C (range from 2.38 to 2.88°C) compared to the period of 1986-2005 (Fig. 4).

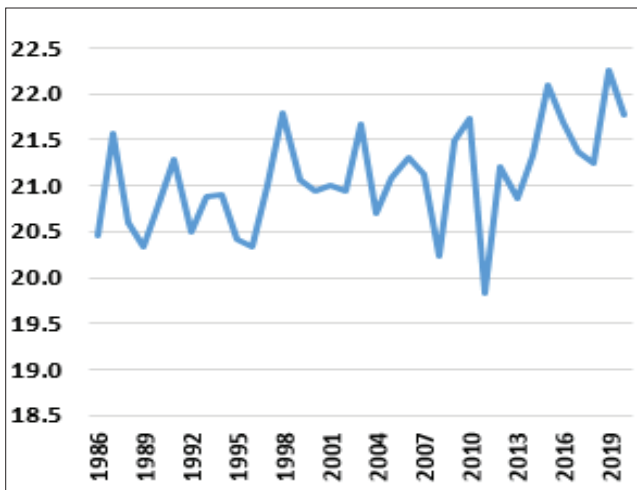


Fig. 2. Average temperature at Bac Yen in the period of 1986-2020. Source: [11].

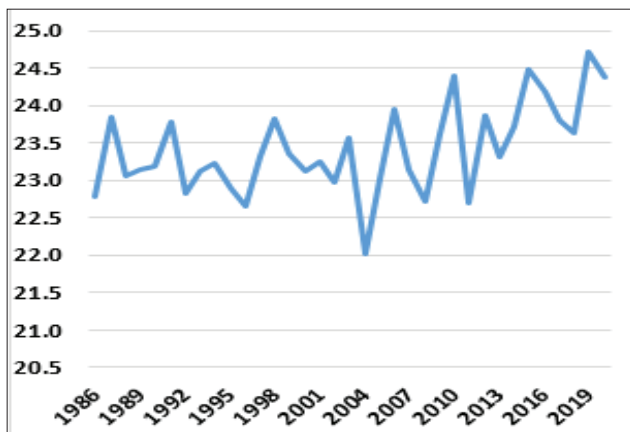


Fig. 3. Average temperature at Yen Chau in the period of 1986-2020. Source: [11].

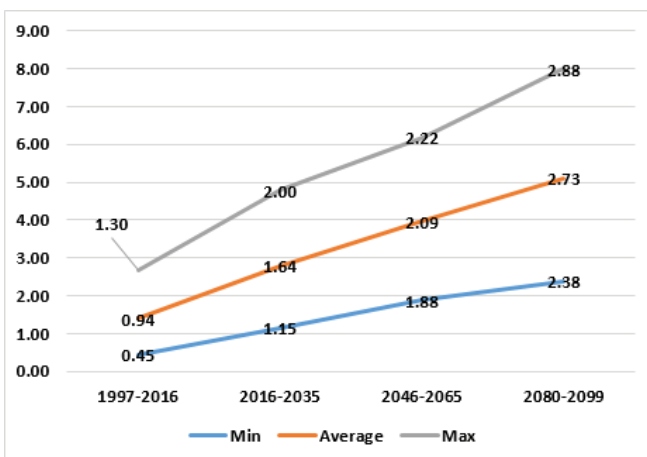


Fig. 4. Temperature scenario during the 21st century in Son La province. Source: [11].

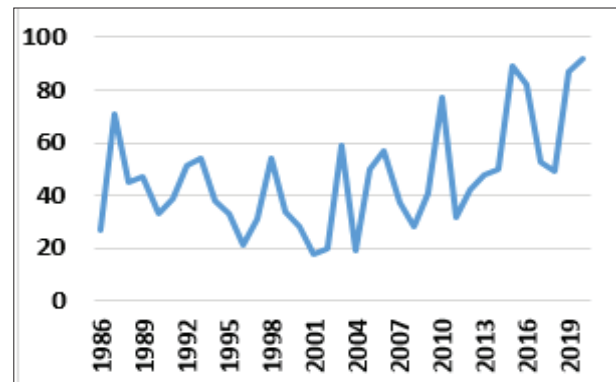


Fig. 5. Number of hot days ($\geq 35^{\circ}\text{C}$). Source: [11].

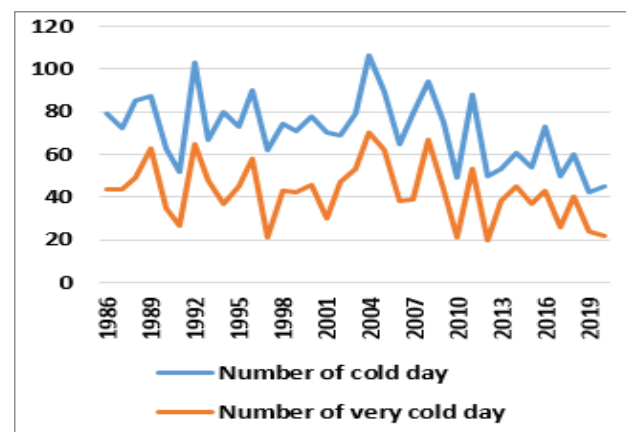


Fig. 6. Number of cold ($\leq 15^{\circ}\text{C}$) and very cold days ($\leq 13^{\circ}\text{C}$). Source: [11].

In parallel with the escalation of average temperature, the hot weather season (summer) in Son La will begin earlier and end later, while the cold weather season (winter) will start later and end earlier. During the period of 1986-2020, the number of hot days ($\geq 35^{\circ}\text{C}$) measured by all the hydro-meteorological stations in Son La province tended to increase (Fig. 5). Meanwhile, the number of days of chilling cold ($\leq 15^{\circ}\text{C}$) and biting cold ($\leq 13^{\circ}\text{C}$) tended to decrease (Fig. 6). The change in average temperature has directly impacted farmers' production timetables, especially in cultivation. Some plants may ripen or be harvested at unusual times, and there could be earlier as well as longer cultivation times. Therefore, farmers may pay more fees or work longer during cultivation.

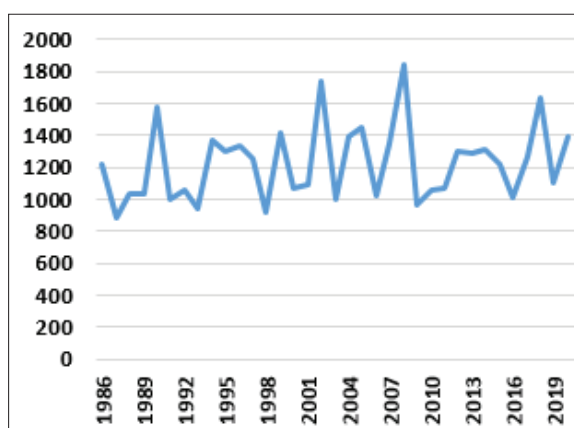


Fig. 7. Rainfall in Son La in the period of 1986 to 2020. Sources: [12].

From 1986 to 2020, the total annual rainfall did not have significant fluctuations, but the rainfall occurred irregularly (Fig. 7). In 1986 and 1998, the rainfall was low (less than 1,000 mm). Conversely, the rainfall increased dramatically in 2008 (more than 1,800 mm). However, rainfall was mainly concentrated in the rainy season (from April to September), which accounted for more than 80% of the rainfall for the entire year. The abundant rainfall is mainly in July and August (Fig. 8). Rain occurred capriciously and the total amount of rain remained constant while the rain period was short, causing floods, droughts, and greatly affecting human life and agricultural production.

3.2. Current status of agricultural cooperatives in Son La

Son La has been one of the top ten leading provinces in terms of the number of cooperatives in Vietnam in recent years. The growth rate of the number of cooperatives in Son La is nearly two times higher than the national average growth rate [13]. In 2020, the number of cooperatives in this province was 661 of which 85% were agricultural cooperatives [7]. During the past 10 years (2010-2020), the number of newly established and active agricultural cooperatives in Son La increased sharply from 90 to nearly 600 in 2020 (Fig. 9).

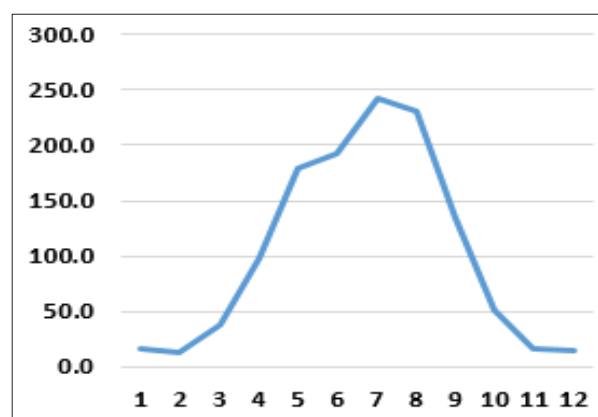


Fig. 8. Distribution of rainfall by month in Son La province. Sources: [12].

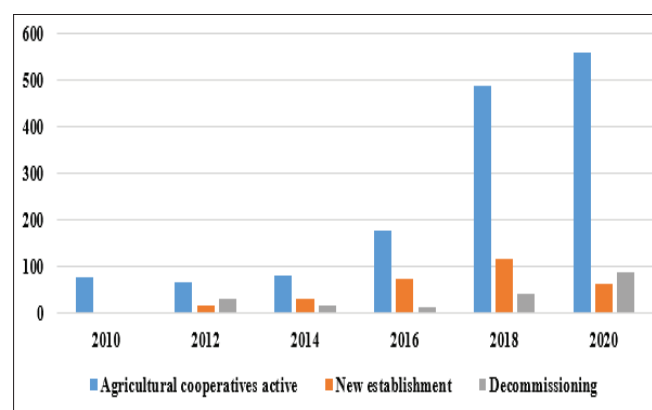


Fig. 9. Number of agricultural cooperatives in Son La over the period 2010-2020. Sources: [12].

The Son La agricultural cooperatives take part in all stages of the production process from input, production, and output stages. Although the proportion of profitable cooperatives is not high, accounting for only 34% of the total number of agricultural cooperatives in 2019, lower than the national average [13], by their specific activities, they have initially played a role in supporting their members in all stages of the production process (Fig. 10). Typically, low input price as well as the advantages of output market linkage have attracted many farmers to be participants of cooperatives. Meanwhile, the supporting local and national policies for agricultural development such as funding, exporting schemes, or high-tech applications have been motivations of agricultural cooperative establishments rather than other forms of cooperatives in Son La.

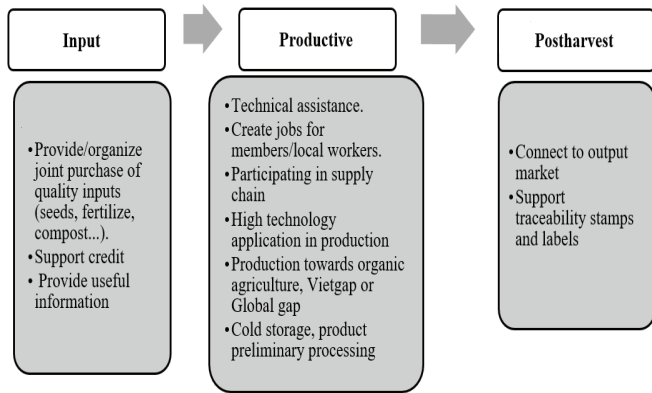


Fig. 10. How agricultural cooperatives support their members during the production process.

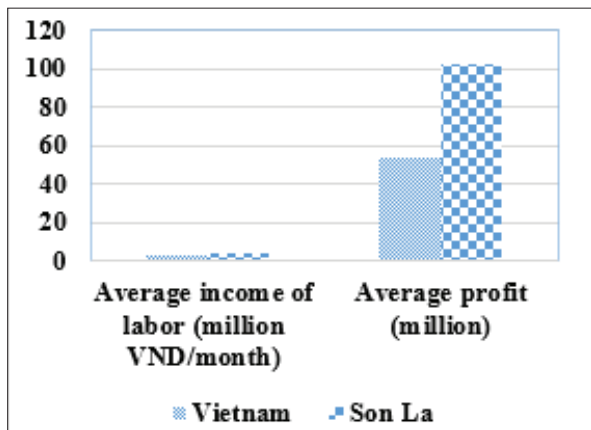


Fig. 11. Performance of agricultural cooperatives in Son La and Vietnam in 2019. Source: [14].

During 2015-2022, many local governments have released plans to encourage agricultural cooperative development such as policies to support the development of production, processing, and consumption of safe agricultural products in the period of 2018-2021 (Resolution No.76/2018/NQ-HDND) (Table 1); policies to encourage the investment in agriculture and rural areas (Resolution No.128/2020/NQ-HDND); etc. Unfortunately, the majority of agriculture cooperatives in Son La are small in terms of assets, capital, and size of members. The average assets and revenue per cooperative are 1.07 and 2.00 billion VND, however, average profit and income per labour of agricultural cooperatives in this province are higher than the national average (Fig. 11).

Table 1. Performance of agricultural cooperatives in Son La, 2018-2020. Source: [14].

Criteria	Year		Compared	
	2018	2020	+/-	%
Total number of members (person)	5,804	6,588	784	14
Average number of members per cooperative (person)	12	12		
Total management (person)	1,800	2,720	920	51
Average number of managers per cooperative (person)	4	4		
Board of manager per cooperative (person)	2	2		
Accountant per cooperative (person)	1	1		
Control board per cooperative (person)	1	1		
Average assets per cooperative (million VND)	921	1,070	149	16
Average revenue per cooperative (million VND)	1,700	2,000	300	18
Average of profit (million VND)	133	200	67	50
Average income of a regular employee (million VND/month)	2.5	4	1.5	60

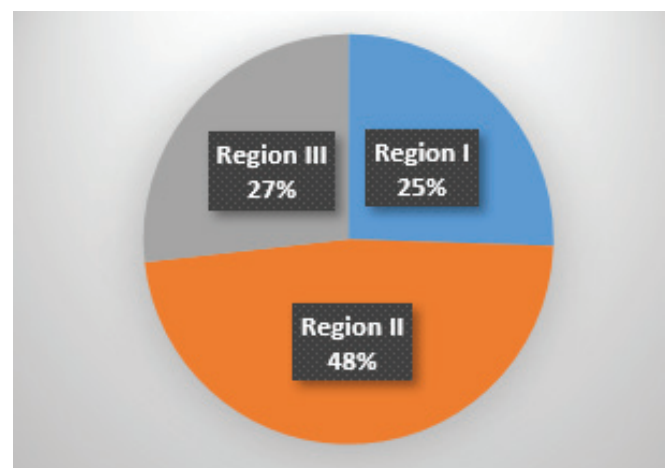


Fig. 12. Proportion of cooperatives under different regions in 2020. Source: [14].

Most agricultural cooperatives are concentrated in Regions 2 and 3, where the economy and other conditions are still difficult as they remain vulnerable to the impacts of climate change (Fig. 12). In addition to supporting members in all stages of the production process, the average income of agricultural cooperative members and labours in 2020 was 4 million VND/month, more than twice higher than the average income of people in this province which is 1.7 million/month [15]. Therefore, the development of cooperatives in this area also plays an important role in ensuring social security, increasing income, and improving the capacity of households to better adapt to climate change.

Cooperative members agree that the benefits they receive when joining cooperatives are buying better quality input, increasing their awareness of technology, complying with environmentally friendly production regulations, or reducing production costs.

3.3. Cooperatives and adaptation of climate change

3.3.1. Performance of adapting to climate change

The change in weather and climate is becoming increasingly extreme. Meanwhile, climate change impacts on agricultural production in particular and people's life in general are increasing. Agricultural production has applied many measures and strategies to cope with the impacts of climate change such as access to climate information and forecasting to build appropriate seasonal plans; choosing new crop varieties that are more drought resistant, have good low-water-use efficiency, or are pest resistant [16, 17]; crop diversification [18]; planting varieties of trees and employing agroforests systems to minimize risk [11]; diversifying farmers' income to improve adaptive capacity [16, 19]; cropping adjustments, changing the growing and harvesting calendar to respond to the changing of climate [19, 20]; applying technology innovations like drip irrigation technology [21] and planting new varieties and breeds with high productivity [22, 23]; adopting new production management and practices [16, 20]; and re-using inputs, reduce greenhouse gas emissions to mitigate climate change. Among them, a very important solution is to improve people's adaptive

capacity through increasing capital (human, social, political, financial, natural, and cultural capital) and resources (technology and infrastructure, information, knowledge, institutions, and the capacity to learn) [11] for long-term living with climate change, which can turn the above solutions into a reality.

Many researchers indicate that, at the individual level, the application of these measures to adapt to climate change have faced many barriers. One of the main factors pointed out is lack of finance [19]. Households with small production scale, lack of access to finance is limiting for innovation and technology investment to respond to climate change [17]. Furthermore, lack of access to timely forecast information [18, 23]; limited knowledge about new farming techniques; poor skills; lack of information about availability and access to government support [4]; inadequate access to input/output market information [23]; lack of training; and even lack of motivation to pursue are constraints to Asian farmers' adaptation. In addition, some adaptation methods such as crop rotation, good agricultural practices and the use of organic fertilizers are often costly, can take a long time to apply, and have not been effective in the short term, leading a smallholder to give up easily.

Cooperatives operate at collective economic models and play as a significant actor in addressing these difficulties of the household level. They contribute to changing members' awareness of climate change and its impacts by sharing and providing weather information, organizing training courses or acting as a bridge for members to participate in training courses organized by government and non-governmental organizations. Agricultural cooperatives choose scientific results such as new varieties, new farming techniques, and new technologies in accordance with their members' status to cope with climate change. They guide eco-friendly processes and support techniques for members [6, 24] and encourage members to pursue good agricultural practice [24], thereby contributing to changing production and business habits of each member that may be harmful to the environment. In addition, the cooperative also acts as a bridge to mobilize and attract financial and social resources from both public/private institutions and NGOs to promote investment in climate-smart agricultural activities. Thus, cooperatives

have contributed to improving adaptation capacity, changing awareness, and enhancing resilience to climate change for members [6, 24, 25].

3.3.2. Adaptation in Son La cooperatives

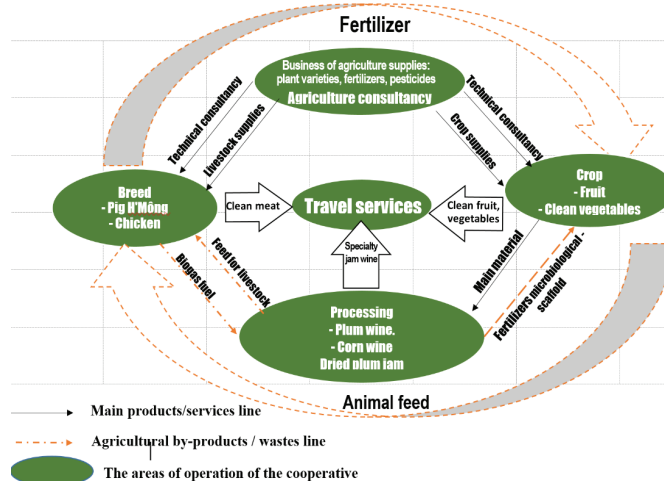
Agricultural cooperatives in Son La province, through their activities, are direct and indirect support to farmers to improve capacity and find solutions to confront climate changes.

(1) Encouraging green and safe production

According to the report of the Son La Provincial People's Committee (2021), over 56% of agricultural cooperatives in this province are vegetable and fruit cooperatives in which nearly 16% of production cooperatives have VietGAP or Global GAP certificates. Through good agricultural production practices according to the VietGAP and Global models, like reducing the use of pesticides and chemical fertilizers and reusing inputs at each stage, agricultural cooperatives in Son La province are directly contributing to the promotion of green production, environmental, and agro-ecosystems protection. Fruit cooperatives contribute to afforestation of hillsides to avoid soil washout. In addition, with successful cooperative models, they create a positive spill over effect, contributing to educating and promoting members and communities to pursue environmentally friendly production activities.

Case 1: 19/5 Agriculture and Services Cooperatives, Son La (Source: Survey, 2020).

The circular economy model contributes to: (1) protecting agro-ecosystems; (2) crop/business diversification; and (3) sustainable development. The 19/5 Agr Coop was established in 2000 in the Moc Chau district. They have run diversity business fields including agricultural production, processing, and providing agricultural tourism services. They apply good practices for livestock and farming, maximizing the reuse of waste products at each stage as an input for the next stage. For instance, the vegetables and tubers leftover from cultivation, waste from processing become feed for livestock, and waste from livestock can make fertilizers for cultivation, fuel/biogas for processing, and fresh products for farming and processing provided to tourists and traders.



Their activities not only decrease waste and minimize carbon emissions to the environment, but also reduce about 15% of the production costs. In addition, the pursuit of clean, environmentally friendly production as well as diversification of activities helps cooperatives better adapt to risks. This contributes towards sustainable development of cooperatives, especially in the current context of climate change and pandemics.

(2) Enhancing adaptive capacity for members

Case 2: Ngoc Hoang Cooperative in Mai Son, Son La (Source: Survey, 2020).

In order to support farmers to combat against increasing pests and diseases in their crops and to have success in supplying output products and collecting more funds for next crop, the Ngoc Hoang Cooperative was established including 10 optimal members in 2016. Notably, this cooperative works to provide all inputs including seeds, materials, fertilizers, and pesticides to members with guaranteed quality at a price about 5% lower than the market price. In cases when their members faced financial difficulties, the cooperative sent to them the policy of buying first - paying later.

Moreover, the cooperative also promises to buy all member products at least 10% higher than the market price. In addition, the cooperative promulgates the production process, training, and guidance for members to reduce pests and diseases, increase productivity, and ensure quality. As a result, since joining the cooperative, the average income of members reached 6-8 million/person/month by 2020 with some households having revenues around

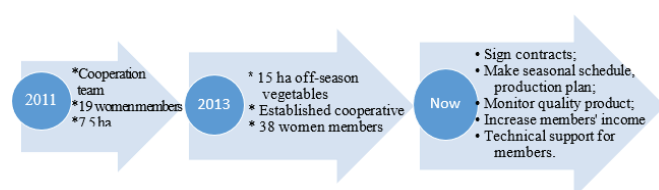
500-600 million/ha/year. Many household members have escaped poverty and increased their financial and technical capacity actively to effectively adapt the climate change. At the end of 2020, the number of members increased to nearly 200.

As mentioned above, agricultural cooperatives support members through all stages of the production process from supplying inputs, organizing joint purchasing, and supporting production to connecting outputs. Specifically, cooperatives provide information about quality inputs at reasonable prices or introduce new varieties, which are suited to the vagaries of the climate. Cooperatives also instruct and assist members in production techniques and output connection. According to the report of Son La Provincial Cooperative Alliance in 2020, there were 171 models of agricultural production and business cooperatives associated with value chains in the province, which have supported members to promote production and product consumption. Those activities have contributed to decreasing producing cost, increasing member income, and enhancing members' adaptive capacity and resilience.

(3) Promoting the application of new technologies and techniques to proactively adapt

Under the impact of climate change and the influence of extreme weather phenomena on agricultural production, the cooperatives have applied adaptation measures to minimize damages and to become proactive and ready to cope.

Case 3: Tu Nhlen Cooperative in Moc Chau, Son La.



This cooperative model has been successful in planting off-season vegetables and adapting to the weather in Moc Chau. To confront the change of weather, link production of clean vegetables, and ensure product output, this cooperative has selected new higher quality vegetable seeds like chocolate tomato, strawberries, cabbage, cauliflower, and so on, as well as change their seasonal calendar

to adapt to local weather. The cooperative actively cooperates with stakeholders to organize training sessions on transferring and applying technology according the VietGAP by using microbial fertilizes. They invested in high-tech applications for producing like sprinkler, rotary, and drip irrigation systems to reduce water loss. They control and monitor the production process in accordance with the VietGAP process, ensuring product quality. The cooperatives' products have been consumed in large supermarkets, industrial kitchens, and schools inside and outside the province thereby increasing income for members by 10 times that of old crops like rice or maize.

In particular, to reduce damage caused by hail, acid rain, and pests, the agricultural cooperatives have applied high-tech cultivation like using nets/net houses to reduce fruit drop caused by hail; or covering crops to minimize water evaporation; and using drip irrigation systems and automatic irrigation to adapt to water shortages and drought. Crop diversification, crop rotation, and intercropping are applied to reduce vulnerability and improve resilience. Short-term crops such as beans and peanuts are intercropped with fruit trees, helping to increase income for producers. In addition to coping with extreme weather, the cooperatives have changed their seasonal calendar and crops. Poor drought-tolerance crops are replaced by varieties, which confer tolerance to drought such as replacing rice and maize by citrus fruit trees. The use of new varieties, which are more resistant to pests and diseases for higher economic efficiency, is also one way that cooperatives choose to adapt to climate change. Agricultural cooperatives have also increased training for members to improve their capacity to transform crops to adapt to climate change.

(4) Improve climate change knowledge of members

Under current local and national policy for cooperative development, training programs including agricultural technique, financial accounting, and administrative management have been annually conducted for members of cooperatives not only in Son La but also in almost every province. Actually, according to annual report of Son La Provincial Cooperative Alliance, during 2019-2020, this Alliance did successfully organize 49 courses in business administrative management for 2,684 learners and 5 courses in agricultural

producing techniques for 184 learners. The funds of these courses were supported mostly by the Cooperative Assistance Fund (CAF), local governments, or NGOs.

Through these courses, besides providing safe or organic producing knowledge, fieldtrip or farm tours or visits are conducted to share good practical models. Consequently, many participants of cooperatives have been enriched in knowledge about climate change. Fortunately, many of them perceived that they need to improve their current production to adapt to climate change in order to increasing success. Moreover, each of them also becomes a trainer to innovate or share experiences with other members to produce more safely and with higher quality.

Additionally, depending on the local government, some departments at the commune level have been found to provide climate change knowledge for farmers or members. It is a typical case in the Quynh Nhai Commune of Son La, where an Aqua-cultural Consulting Office has been established as specific local government department in 2016 to guide most Fishery cooperatives in keeping a clean water environment or to use qualified feeds as a reaction to climate change.

4. Discussion and recommendations

4.1. Discussion

4.1.1. Orienting to green and safe agricultural production to adapt to climate change

Under conditions of safe or organic cultivation, chemical fertilizers have been reduced or eliminated, therefore, the soil and water system have suffered from fertilizer poison previously [26]. According to ICA (2014), in some cases, the technique of organic production can lead to a significant program of climate change adaptation to identify strains or methods that are more resilient to changing climate conditions. The requirements, however, of these cultivations are often from a Vietnamese farmer or household resource, especially in the land area prerequisite. Meanwhile, the cooperative model can solve these obstacles because of gathering multi-individual resources as farmer group. From an ICA report in 2014, an organic cooperative successfully developed a farmer-owned wind farm and their operations do not use synthetic fertilizers. This means that cooperatives applying safe cultivation often strongly influences green production orientation on their members.

In fact, the research observation in the case of the 19-5 Cooperative that applied the circular economy model (including safe and organic cultivation), each member taking cooperatives needs to agree to keep cultivation safe by reducing the use of pesticides, increasing the use of biological products, and contributing to afforestation of hillsides to avoid soil washout. The members of cooperative have conducted many positive operations for climate change adaptation. Typically, the cooperative also maximized the re-use of waste products at each stage, which is used as an input for the next stage, limiting emissions to the environment, protecting land, water, and air resources under the context of green production. As a significant achievement, through this cooperative, the farmers as the cooperative members have benefits in not only the input material price but also agro-ecosystem protection, at least compared to non-members at the same location.

4.1.2. Effectively innovate in the community to adapt to climate change in rural areas

The original purpose of a cooperative is to include any person who has similar motivations and conditions of earning money, that is willing to improve her/his economic condition, agrees the general principles of cooperative as a volunteer, and is considered to be participant or cooperative member. Actually, under the current law on cooperatives (2012), one cooperative needs at least 7 members in minimum for startup. Many cooperatives in Son La have members who are also members of a family. These members join together in almost all activities of the cooperative, therefore, operation in climate change adaptation or mitigation by cooperative impacts their members greatly and can easily inspire the benefits of adaption to those in or outside of organization. As mentioned in ICA (2014), cooperatives are a source of stability for communities [24].

During the fieldtrip to Son La, the study collected information from many farmers who were at first not a member of cooperative, but after observation of the good practice cooperative model they had a desire to become a member of a cooperative. According to N.T. Huong (2021) [27], not only in Son La but also in many other provinces, the farmer takes part in the cooperative when her/his relatives are also members of agricultural cooperatives. Many of them are motivated by the green innovation of agricultural

cooperatives [27]. Therefore, it is no doubt that the cooperative model is a good way to effectively innovate the community for adaptation to climate change in rural areas.

4.1.3. Link officers and farmers in implementations of environmental protections

Normally, any government policy that has been brought into practice needs substantial support from actors on the national and local level. It is difficult for farmers to be in compliance with a national law without guidance being implemented. According to OECD (1998), implementing policies through organized groups is often more effective or less costly than through individual agents. Research by P.B. Duong (2012, 2015) [28, 29], indicates that cooperatives can link up with rural communities with higher scale public and private institutions including governments, development agencies, and agribusiness companies. The similar idea of OECD (1998) to sustainable agriculture was the cooperative approach [30]. This means the cooperative has solidarity to reduce negative impacts on people and communities from climate change. Along the same lines, especially in agricultural policies of environment protection, Vietnam cooperatives have also emerged as a potential entity to transfer these regulations to farmers and households by their advantages in structure and characteristics in relationships among members [28]. Actually, in both case boxes in this study, many government policies have supporting funds for training sessions or to apply high technology for farmers who have to be the members of agricultural cooperatives. In deep interviews of these two cooperatives, the study explored that farmer activities in climate change adaption are accomplished by imitating other members rather than complying with regulation. This evidence proves the role of the cooperative as the connector of farmers and government officers to implement environmental policies.

4.1.4. Reduce negative activities that destroy agricultural ecology

Frequently, a farmer who has tended to cultivate using the same technique as other member taking part in a cooperative is able to contribute to reducing damage to the agricultural ecology [24]. For instance, the farmer groups under cooperative members can recycle thousands of tons of animal manure and

inedible food waste from a single farmer collection or local grocery store into renewable power for the grid using a biogas generator. Research by D.V. Cong (2017) shows that Son La releases about 136.88 thousand tons of rice straw and 130.92 thousand tons of corn cob every year [15]. However, under cooperative agreement, the member needs to follow the cooperative regulation in green production, which are at least of not burning and completing recycling to protect the environment as the cases of two specific cooperatives in this research.

4.1.5. Apply solutions for climate change adaptation

The positive advantages in land area, capital, and funding support from the government push the cooperative model to create more convenient situations than a single farmer. For instance, the opportunities of applying smart or high-tech cultivation techniques are more than what an individual household receives by local government incentives. Under local government projects, with priority conditions to the cooperative, the state budgets including funds for climate change adaptation are often sent to the member of a cooperative instead of the single farmer [13, 28]. As in the case of the 19-5 Cooperative or natural safe vegetable cooperatives, crop cover facilities and net houses were applied to effectively minimize water evaporation or reduce damage caused by rime, hail, acid rain, and pests. The farmers did not necessarily have to consider much in terms of capital investment or how to apply it in their fields. These situations faced by cooperatives have many solution options for adapting rather than other business forms, at least during 2015-2020 in Son La [13].

4.2. Recommendations

Cooperatives, from the findings of this study, are an emerging form to adapt to climate change. For the purpose of increasing climate change adaptation, the cooperative development has been a good solution. The number of farmers in cooperatives is increasing more and more as the methods of adapting to climate change are applied in the agricultural sector. To encourage farmers to take part, the stimulation of good practice cooperative cases needs to be conducted in different ways. The following solutions should be prioritized to obtain achievements in adaptation to climate change in Son La:

(1) Support technology for the safe and green production through the cooperative model: The numbers of cooperatives are selected to support transparent conditions that will be motivation for many cooperatives to run well. Consequently, their members also perceive their benefits to enjoy and apply adapting methods;

(2) Supply agricultural services for using safe input: This is a direct way to reduce damages in agricultural infrastructure. By using compost, seeds, pesticides, etc. as safety cultivation, the farmer contributes to environmental protection.

(3) Be the wholesalers or centre agents for selling outputs (post-harvest), etc.: Consider that any farmer only agrees to be a member of a cooperative if her/his benefits are protected or increased. One important warrant for members' benefits is a solution for selling their products. In this case, a cooperative operates as being centre agents and the cooperative easily attracts many farmers to be members as volunteers. This is a good situation for effectively applying adaptations to climate change.

(4) Improve local and national government policies, especially in raising funds, better administrative procedures, and promoting good agricultural products, etc. The analysis of cooperative roles in the last sections shows that government policies are very important to establish good practice models. For example, a stimulated regulation for implementation strongly contributes to a good motivation for farmers taking part in cooperatives. Therefore, more improvement in policies is necessary for climate change adaptation not only in Son La but also in other provinces in Vietnam.

5. Conclusions

Farmers and householders face complex decisions every day relating to their cultivation in the context of climate change. With the desire to create a document encouraging membership in a cooperative to place farmers in good positions to adapt to climate change, this study concentrated on confirming the active roles of cooperatives in applying methods to reduce damages from the impacts of climate change. Through case studies and cause-effect analysis, significant evidence was uncovered demonstrating the functions of cooperatives in agricultural production. Indeed, some of the advantages of cooperatives in adapting to climate change are: green and safe production;

innovation; good practice model to community; effective linkage among officers and farmers by implementing national and local policies; and strong contributions to adaptation of climate change or reductions in negative activities associated with climate change. In order to stimulate climate change adaption, more members in a cooperative should can be obtained by raising funds and applying for support in implementing smart techniques and safe input materials. Moreover, models of good practice cooperatives should be exhibited to help form new cooperatives.

CRediT author statement

Thi Hai Vu: Conceptualisation, Data analysis, Writing, Discussion; Thi Diem Hong Phi: Supervision; Conceptualisation, Data analysis, Writing, Methodology, Discussion, Recommendations, Conclusions; Dang Hoc Nguyen: Secondary data analysis, Writing; Quang Trung Tran: Conceptualisation, Data analysis.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] IPCC (2021a), "Climate change widespread, rapid, and intensifying - IPCC", *ScienceDaily*, <https://www.sciencedaily.com/releases/2021/08/210809111125.htm>, accessed 9 August 2021.
- [2] Government of Nepal, Ministry of Agricultural, Land Management and Cooperatives (2018), *Impact of Climate Change Finance in Agriculture on the Poor*, Planning Division, Ministry of Agricultural, Land Management and Cooperatives, 56pp.
- [3] IPCC (2021b), "Summary for policymakers", *Climate Change 2021: The Physical Science Basis*.
- [4] International Labour Office (2008), "Confronting climate change through cooperative enterprise", *Statements 2008, 14th UN International Day of Cooperatives*.
- [5] Y. Qu, Y. Liu, S. Jevrejeva, et al. (2020), "Future sea level rise along the coast of China and adjacent region under 1.5°C and 2.0°C global warming", *Advances in Climate Change Research*, **11**(3), pp.227-238.
- [6] Food and Agriculture Organization (2008), "Confronting climate change through cooperative enterprise", *Message from The Food and Agriculture Organization (FAO) of the United Nations 11th UN International Day of Cooperatives*.
- [7] Son La Provincial Cooperative Alliance (2021), *2020 Annual Report* (in Vietnamese).

- [8] Vietnam National Committee (2022), *Resolution No.20-NQ/TW on The Approval of Continuous Innovation, Development and Improvement Collective Economic Efficiency in The Next Stages*, <https://thuvienphapluat.vn/van-ban/Thuong-mai/Nghi-quyet-20-NQ-TW-2022-doi-moi-phat-trien-kinh-te-tap-the-trong-giai-doan-moi-518811.aspx>, accessed 16 June 2022 (in Vietnamese).
- [9] Son La Provincial People's Committee (2022), *Resolution No.23-NQ/TU on The Approval of Developing Non-state Enterprises and Cooperatives to 2025 in Son La*, <https://sonla.gov.vn/4/469/71824/652769/van-ban-phap-luat-ho-tro-doanh-nghiep/nghi-quyet-so-23-nq-tu-ve-phat-trien-doanh-nghiep-ngoai-khu-vuc-nha-nuoc-hop-tac-xa-tren-dia-ban>, accessed 31 August 2022 (in Vietnamese).
- [10] Vietnam - National Determined Contribution (2020), "National reports", *Updated National Determined Contribution Public*, https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Viet%20Nam%20First/Viet%20Nam_NDC_2020_Eng.pdf, accessed 8 November 2022 (in Vietnamese).
- [11] Yen Chau and Bac Yen Hydro-Meteorological Station (2020), *Statistics on Weather and Climate Change in The Period of 1986-2020*, Working reports (in Vietnamese).
- [12] V.T. Hai, N.D. Hoc, P.T.D. Hong, et al. (2021), "Roles of agricultural cooperatives in supporting farmers to adapt climate change: Case study in Son La province, Vietnam", <https://www.adb.org/news/events/building-sustainable-resilient-agriculture-asia-pacific-amid-new-challenges>, accessed 13 September 2021.
- [13] Son La Provincial People's Committee (2021), *Decision No. 701/QĐ-UBND on The Approval of a Project to Develop and Update Actions to Adapt Climate Change in The Period of 2021-2030, with a Vision to 2050 in Son La* (in Vietnamese).
- [14] Vietnam Ministry of Planning and Investment (2021), *2021 White Book on Vietnamese Co-operatives*, Statistic Publisher, 492pp (in Vietnamese).
- [15] D.V. Cong (2017), "Making compost from available agricultural residue in Son La", *Journal of Environment*, **11**, <http://tapchimoitruong.vn/nghien-cuu-23/San-xuat-phan-u-huu-co-tu-phu-pham-nong-nghiep-san-co-tai-Son-La-14420>, accessed 17 November 2022 (in Vietnamese).
- [16] S. Mustapha, U.C. Undiandeye, M. Gwary (2012), "The role of extension in agricultural adaptation to climate change in the Sahelian zone of Nigeria", *Journal of Environment and Earth Science*, **2(6)**, pp.48-58.
- [17] E. Oruonye, M.U. Osigwe, A. Abdullahi, et al. (2019), "The role of government institutions in supporting smallholder farmers' adaptation to climate change in Gombe State, Nigeria", *International Journal of Pure Agricultural Advances*, **3(1)**, pp.1-13, DOI: 10.20448/813.31.1.13.
- [18] F. Ndamani, T. Watanabe (2016), "Determinants of farmers' adaptation to climate change: A micro level analysis in Ghana", *Scientia Agricola*, **73**, pp.201-208, DOI: 10.1590/0103-9016-2015-0163.
- [19] T.S. Saguye (2016), "Determinants of smallholder farmers' adoption of climate change and variability adaptation strategies: Evidence from Geze Gofa district, Gamo Gofa zone, Southern Ethiopia", *Journal of Environment and Earth Science*, **6(9)**, pp.147-161.
- [20] H. Yohannes (2016), "A review on relationship between climate change and agriculture", *Journal of Earth Science and Climatic Change*, **7(2)**, DOI: 10.4172/2157-7617.1000335.
- [21] J. Frankel-Reed, B. Fröde-Thierfelder, I. Porsché, et al. (2011), *Integrating Climate Change Adaptation into Development Planning*, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 78pp.
- [22] K. Asayehegn, A. Iglesias, B. Triomphe, et al. (2017), "The role of systems of innovation in adapting to climate change: The case of the Kenyan coffee and dairy sectors", *Journal of Innovation Economics & Management*, **24(3)**, pp.127-149, DOI: 10.3917/jie.pr1.0015.
- [23] T.H. Nguyen, O. Sahin, M. Howes (2021), "Climate change adaptation influences and barriers impacting the Asian agricultural industry", *Sustainability*, **13(13)**, DOI: 10.3390/su13137346.
- [24] Sustainability Solutions Group (2014), *A Co-operative Solution to Climate Change*, 78pp.
- [25] A. Vizinho, D. Avelar, C. Branquinho, et al. (2021), "Framework for climate change adaptation of agriculture and forestry in Mediterranean climate regions", *Land*, **10(2)**, DOI: 10.3390/land10020161.
- [26] M. Allam, E. Radicetti, V. Quintarelli, et al. (2022), "Influence of organic and mineral fertilizers on soil organic carbon and crop productivity under different tillage", *Agriculture*, **12(4)**, DOI: 10.3390/agriculture12040464.
- [27] N.T. Huong (2021), *Creative Innovation Green: Research Experience in Cooperatives in Vietnam*, 17pp.
- [28] P.B. Duong (2012), "Theoretical and practical considerations concerning the development of new type cooperative in agriculture", *Journal of Economic Studies*, **12(415)**, pp.38-46 (in Vietnamese).
- [29] P.B. Duong (2015), "A number of theoretical and practical issues for developing cooperatives in rural Vietnam", *Journal of Economic Studies*, **10**, pp.48-54 (in Vietnamese).
- [30] R. Steenblik (1998), *Co-operative Approaches to Sustainable Agriculture*, Project: Agricultural policies, 108pp.

Behaviours of restaurants in a beef value chain in Dien Bien province

Bui Van Quang^{1*}, Nguyen Thi Duong Nga¹, Pham Van Hung¹, Duong Nam Ha¹,
Tran The Cuong¹, Han Anh Tuan², Le Thi Thanh Huyen², Stephen Ives³

¹Faculty of Economics and Rural Development, Vietnam National University of Agriculture,
Trau Quy Town, Gia Lam District, Hanoi, Vietnam

²Department of System Research and Livestock Environment, National Institute of Animal Science,
9 Tan Phong Street, Thuy Phuong Commune, Bac Tu Liem District, Hanoi, Vietnam

³College of Business and Economics, University of Tasmania, Centenary Building, Grosvenor Street, Sandy Bay, Tasmania, Australia

Received 11 January 2023; revised 3 March 2023; accepted 28 March 2023

Abstract:

This study explores the behaviours of restaurants and food stores as meat consumption agents in the beef value chain in Dien Bien province by utilising survey data and focus group discussions (FGDs) with restaurant and eatery owners in Dien Bien Phu city and the town of Tuan Giao. Descriptive statistics, T-tests, and Chi-squared tests are used to analyse the data. The research results showed that restaurants and eateries use fresh beef and imported beef. They buy fresh beef daily and mainly from slaughterhouses, wholesalers, and retailers. The important criteria for beef selection are freshness, stickiness, and colour, and owners prefer local beef because it is more suitable for local dishes. In general, restaurants do not face many difficulties in sourcing meat, but sometimes they cannot buy the desired amount of meat and are afraid of receiving buffalo meat instead of beef...The high price of fresh beef is a problem for them as it increases the cost of doing business and reduces competition. In addition, the trend of changing culinary styles with dishes made from imported beef brings both opportunities and challenges for cattle farmers in Dien Bien province. On that basis, this article proposes several solutions related to supply development as well as building linkages to ensure traceability.

Keywords: beef value chain, consumption, Dien Bien, restaurant.

Classification numbers: 2.2, 7

1. Introduction

Restaurants, hotels, and other food service providers are important customers in the meat value chain, especially in processing fresh meat into dishes [1]. The COVID-19 pandemic, with the closure of restaurants and eateries, has reduced meat consumption by up to 25% and has had a major impact on the meat value chain in Pakistan [2]. Despite this, the study of restaurant behaviours is generally more concerned with the role of restaurants in the food value chain, creating added value through the processing of various dishes, and less often analysing the behaviours of restaurants and eateries as a buying agent in the fresh meat value chain. In a locality, small restaurants or eateries are also important consumers as fresh meat is an indispensable ingredient for creating signature dishes [3]. J. Dzanja, et al. (2013) [4] analysed beef value chains in Central and Southern Malawi, and restaurants were identified

as one actor in the value chain. USAID (2018) [5] also identified that restaurants are an important node in meat value chains. Restaurant actors, however, are not analysed in detail in these studies. Safefood (2008) [6] highlighted that restaurants are required to provide information to consumers on the country of origin of any beef served on the premises. However, consumers were also dubious about believing origin claims on menus, citing that restaurants would alter their beef sources.

Dien Bien is a north-western province with the potential to raise ruminants for meat (buffalos and cows). In 2021, the total beef cattle population was recorded at about 94,000, ranked 6th among the 14 provinces in the northern midlands and mountains, and ranked 28th among the 64 provinces in the country [7]. Cattle production has gained the attention of the provincial People's Committee. This is considered one of the economic development directions to

*Corresponding author: Email: bvquang@vnua.edu.vn

serve the restructuring of the livestock sector as well as the agricultural sector of the province. The provincial People's Committee has many policies to develop cattle production in general and beef cattle in particular. In 2008, the Australian Centre for International Agricultural Research (ACIAR) sponsored the project LPS/2008/049 "Overcoming technical and market barriers for more efficient beef cattle raising in the Northwest of Vietnam", which was implemented in the period 2011-2015 [8]. The research results showed that the local beef value chain plays an important role for cattle farmers in Dien Bien province. In 2018, the LPS/2015/037 project "Intensification of beef cattle production in upland cropping systems in Northwest Vietnam" (implemented in the period 2018-2022) focused on approaching the value chain in the development of beef cattle breeding and selected Tuan Giao and Dien Bien districts for technical and economic interventions. In particular, restaurants and eateries are important actors in the beef value chain here [9], which is the consumption agent of beef in large quantities. However, the behaviours of this agent in the beef value chain have not been well analysed. This study aims to analyse the behaviours of restaurants and eateries in the beef value chain of Dien Bien province and identify opportunities as well as proposed solutions to upgrade the beef value chain to better meet the needs of consumers.

2. Methodology

Secondary data was collected through reports from the Department of Statistics of Dien Bien province and other departments related to agriculture and animal husbandry. Primary data was collected through a survey and group discussion. The total number of surveyed samples was 12 restaurants and 48 eateries in 2019, in Dien Bien Phu city and the town of Tuan Giao, including restaurants in the Muong Thanh and Him Lam hotels. The sampling method was convenience sampling [10]. In addition, three FGDs were conducted with restaurant owners with a total number of 16 participants.

The method of data analysis used was descriptive and comparative statistics with the t-test for the mean comparison and Chi-squared test for proportions. The sample was classified into two groups including restaurants with the number of people served = 100 people/day or more and those having business registration and serving less than 100 people/day.

3. Results

3.1. Overview of the beef value chain in Dien Bien province

The beef value chain in Dien Bien province has similar functions and characteristics to other meat value chains (pig and poultry) including input supplier, producer, collector, slaughterhouse, wholesaler, retailer, and consumer (Fig. 1). The main inputs for beef/cow production are calf, grass, and veterinary drugs. Households also raise cows to provide calves by themselves.

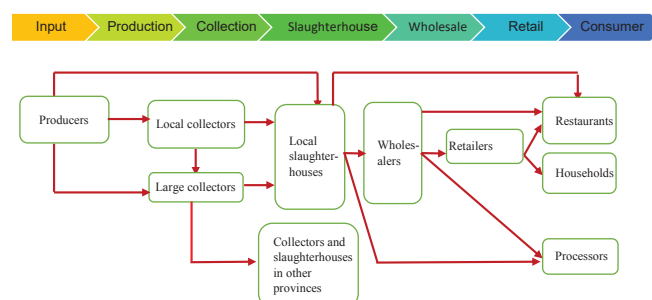


Fig. 1. Map of beef value chain in Dien Bien province [9].

Small-scale households mainly raise beef cattle. In the province, there are several large-scale farms and households engaged in fattening activities. These households sell beef cattle to local or large-scale collectors outside the province. Slaughterhouses may also directly collect beef cattle from these households for slaughter, sell them to other collectors, or sell them to households fattening beef cattle. In Dien Bien and Tuan Giao districts, there are no large slaughterhouses, only small slaughterhouses with a scale of fewer than 5 heads/day. The customers of these slaughterhouses are retailers in markets, restaurants, eateries, households/meat processing facilities, and household consumers. Restaurants and eateries mainly consume grade-A meat including tenderloin and thigh meat. Horizontal linkages in the beef value chain in Dien Bien have been established and developed recently. In 2021, there were two cooperatives raising ruminants and twelve cooperatives supplying services for raising and marketing ruminant products. However, the vertical linkages in the beef value chain in Dien Bien have not been developed. There is no official link between the actors in the beef cow value chain in Dien Bien province. The relationship between restaurants and eateries with the slaughterhouses is relatively closer with restaurants and eateries notifying the quantity and type of beef to slaughterhouses by phone the day before delivery.

3.2. General information on restaurants in the Dien Bien beef value chain

The average age of restaurant owners is quite young, around 43 years old, and there is no difference between groups of restaurants. There is also quite a balance of gender, with about 50% of the food service establishments operated by women, and the rest are operated by men (Table 1).

Table 1. General information about the owners of restaurants.

Item	Casual dining (n=48)	Restaurant (n=12)	Average (n=60)	P-value
1. Age (years)	42.90	43.33	42.98	0.89 ^{NS}
2. Gender (%)				
Male	54.17	33.33	50.00	0.197 ^{NS}
Female	45.83	66.67	50.00	
3. Ethnic group (%)				
Kinh	91.67	75.00	88.33	0.108 ^{NS}
Thai	8.33	25.00	11.67	
4. Schooling year (years)	9.90	10.58	10.03	0.544 ^{NS}
5. The average number of customers per day	66.81	213.33	96.12	2.0 ^{***}
6. Quantity of meat processed in a day (kg/day)				
Pork	3.09	14.70	5.81	9.47E-06 ^{***}
Poultry meat	4.84	10.50	6.00	0.02 ^{**}
Beef	3.82	5.98	4.22	0.109 ^{NS}

Note: *** is significant at 1%. ** is significant at 5%. NS is not significant at 10% probability level. T-test for mean comparison and Chi-squared test for proportions. Source: Results of the survey on beef consumption in Dien Bien province under the project "Intensification of beef cattle production in upland cropping systems in Northwest Vietnam", 2019.

In terms of ethnic composition, the majority of restaurant and diner owners are Kinh ethnic people (about 80% of the sample). Most of them have finished high school, with an average number of 10 schooling years. The average daily capacity varies significantly between restaurants and eateries, with the serving ratio close to 70 for casual dining and 213 for restaurants (Table 1). Restaurants serve on a larger scale and with better facilities. High-class restaurants in the study area include the Huong Dong Noi restaurant, Song Hy restaurant, and Dien Bien Muong Thanh restaurant, including restaurants specializing in ethnic dishes made from beef such as the Quan Ethnic restaurant. Smaller-scale eateries, which usually serve breakfast needs (rice vermicelli, noodle soup) and rice rations (low-cost eateries) have

emerged more than snack eateries and street eateries which serve mainly younger customers with dishes such as hot pot, grilled dishes, and Korean-style barbeque. The meats mainly used in restaurants and food stores are pork, poultry, and beef. The average meat consumption per day of restaurants is much higher than that of eateries due to larger serving sizes with 14.70 kg of pork, 10.50 kg of poultry, and 5.98 kg of beef for restaurants and 3.09 kg, 4.84 kg, and 3.82 kg, respectively, for casual dining. Restaurants use more pork and chicken than casual dining, but the amount of beef used is not significantly different between these two types of food service (Table 1).

3.3. Beef consumption behaviour of restaurants and casual dining

The main supplier of beef to restaurants and eateries is the retailer (about 2/3 of restaurants and eateries). The rest comes mainly from slaughterhouses and wholesalers. Small eateries tend to buy more beef from retailers outside the market, mainly due to small volume. Restaurants and hotels buy beef from slaughterhouses, wholesalers, and retailers, and usually they have a few regular suppliers. For hot pot stalls, they buy imported beef (frozen beef) at local supermarkets. Most small restaurants often buy directly at the place of sale (slaughterhouses, wholesalers, or retailers), and restaurants often have been delivered to their establishment (Table 2). Some restaurants and stalls choose to go to the slaughterhouse to buy beef because they are worried that beef can be mixed with buffalo meat if purchased at the market. Restaurants and eateries buy fresh beef every day, for imported meat they can buy large volumes and store them in the freezer for many days. There are significant differences in the choice of beef supplier and the location of beef purchase between restaurants and eateries.

Table 2. Buying sources and locations of interviewees.

Item	Casual dining (n=48)	Restaurant (n=12)	Average (n=60)	P-value
Buying sources (%)				
Slaughterhouse	10.42	33.33	15.00	0.021 ^{**}
Wholesaler	14.58	33.33	18.33	
Retailer	75.00	33.33	66.67	
Buying methods (%)				
Buying at seller's place	75.00	33.33	66.67	0.006 ^{***}
Buying at buyer's place	25.00	66.67	33.33	

Note: *** is significant at 1%. ** is significant at 5% (Chi-squared test). Source: Results of the survey on beef consumption in Dien Bien province under the project "Intensification of beef cattle production in upland cropping systems in Northwest Vietnam", 2019.

The relationship with the seller is considered very important for the owner of the restaurant. Long-term relationships have benefits for both parties. For the restaurant, it is provided with sufficient quantity and the quality of the meat is guaranteed and at a reasonable price. Therefore, owners often prefer to buy meat from suppliers with long-term relationships. The next criterion is to choose sellers who have a superior sources of goods to ensure the quantity of meat that restaurants and eateries desire (Table 3). Hygiene at the place of supply (slaughterhouses, wholesale/retail) is also considered, especially for restaurants. Other criteria such as the distance to the location to buy meat or the price are less important, "beef prices are already high and there is almost no significant difference between places, so it is not too important". There is no statistically significant difference in the scores of the two groups (Table 3).

Table 3. Criteria for choosing the suppliers and types of beef.

Item	Casual dining (A) (n=48)	Restaurant (B) (n=12)	Average (n=60)	Difference (A-B)
<i>Criteria for choosing the suppliers</i>				
Relationship with suppliers	8.91	9	8.93	-0.09 ^{NS}
Availability level	8.38	8.38	8.38	-0 ^{NS}
Hygienic situation at buying places	7.93	8.5	8.03	-0.57 ^{NS}
Distance to buying places	6.46	5.86	6.36	+0.6 ^{NS}
Price	6.01	7.61	6.33	-1.6 ^{NS}
<i>Criteria for choosing beef</i>				
Freshness	9.22	9.73	9.32	-0.51 ^{NS}
Stickiness	9.17	9.33	9.2	-0.16 ^{NS}
Colour	8.17	8.64	8.27	-0.47 ^{NS}
Texture	6.9	8.21	7.12	-1.31 ^{NS}
Smell	6.76	7.67	6.93	-0.91 ^{NS}

Note: From 1-10, 1 least important, 10 most important, NS is not significant at 10% probability level (T-test). Source: Results of the survey on beef consumption in Dien Bien province under the project "Intensification of beef cattle production in upland cropping systems in Northwest Vietnam", 2019.

The quality of meat is especially important for restaurants, thus, they choose meat very carefully. The most important criterion is freshness as it determines the taste of the dish, especially dishes where meat is less processed such as pho and vermicelli (FGD). The stickiness and colour of meat are also important criteria for restaurants and eateries because fresh

meat often has a high stickiness and red colour, requiring flexible meat that can stick to the knife. Restaurants and eateries are also interested in meat fibres and prefer beef with small, smooth meat fibres because they believe it to be from local cows (FDG). Owners were also interested in the smell of meat, because through smelling the meat, it was possible to detect the freshness of the meat, or whether the beef came from a diseased cow.

Table 4. Types of beef daily purchased by restaurants (kg/day).

Type of beef	Casual dining (A) (n=48)	Restaurant (B) (n=12)	Average (n=60)	Difference (A-B)
Corn	2.31	4.38	2.71	-2.07***
Bacon	1.81	12.67	3.98	-10.86**
Sirloin	2.22	3.63	2.42	-1.41 ^{NS}
Organs	1.54	1.58	1.56	-0.04 ^{NS}
Flank steak (Nạm)	1.00	0	1.00	+1 ^{NA}
Brisket	0.83	0	0.83	+0.83 ^{NA}
Tail	1.55	0	1.55	+1.55 ^{NA}

Note: *** is significant at 1%. ** is significant at 5%. NS is not significant at 10% probability level (T-test). Source: Results of the survey on beef consumption in Dien Bien province under the project "Intensification of beef cattle production in upland cropping systems in Northwest Vietnam", 2019.

In general, restaurants and eateries all use beef in their dishes, while eateries tend to use more types of meat due to a wider variety of beef dishes. The types of beef commonly used in restaurants and eateries are corn, bacon, and sirloin (Table 4) with an average daily consumption of 2.31 kg of corn, 1.81 kg of bacon, 2.22 kg of sirloin; this figure is 4.38, 12.67, and 3.63 kg for restaurants, respectively, and there is a significant difference in purchasing amount of corn and bacon between the two groups. In comparison with the size of servings, the volume of beef in restaurants is quite high compared to restaurants, mainly because many restaurants specialize in noodles and drinking dishes, so beef ingredients account for greater proportions. Some restaurants process local dishes such as beef skin effigy, beef tendon soup, beef tail with foil, beef tail stew, stir-fried dishes, and grilled with offal or winged (FGD). Restaurants and eateries often buy more if customers order, or on weekends, especially in the city. November and December of the lunar calendar every year is a time when demand also increased due to the need to eat at festivals, weddings, and meetings.

In general, restaurants and eateries have not yet encountered the situation of not being able to buy beef because they have a few supplier options, and in general slaughterhouses operate quite regularly (FGD). In a situation where beef is not available at the source, restaurant and diner owners react quite differently, while diner owners will find the right type of beef at other stores (27% of diner owners), restaurants will either buy the same type of beef, or they will switch to another type of beef or wait to buy it later (Table 5).

Table 5. Responding of casual dining and restaurants in some scenarios (%).

Item	Casual dining (n=48)	Restaurant (n=12)	Average (n=60)
<i>Desired beef is not available</i>			
Wait and come back later	4.17	8.34	5.00
Buy different types	2.08	8.33	3.34
Go to other outlets to buy desired beef	27.08	8.33	23.33
Not applicable	66.67	75.00	68.33
<i>Low quality beef</i>			
Buy less amount	4.17	8.33	5.00
Buy other types at the same outlet	2.08	0.00	1.67
Go to other outlets to buy desired beef	93.75	91.67	93.33
<i>Lower price</i>			
Buy more at the same outlet	2.08	8.33	3.33
Buying amount is not changed	97.92	91.67	96.67
<i>Higher price</i>			
Buy less at the same outlet	2.08	8.33	3.33
Buy other types	16.67	16.67	16.67
Buying amount is not changed	81.25	75.00	80.00

Source: Results of the survey on beef consumption in Dien Bien province under the project "Intensification of beef cattle production in upland cropping systems in Northwest Vietnam", 2019.

While there are fewer problems with the quantity of meat desired, most restaurant owners have encountered a situation in which the quality of meat is not guaranteed - usually freshness or meat origin. At that time, the majority (>90%) of restaurant owners choose to buy in other stores, the main reason is that the particular meat is needed for their dishes and it cannot be replaced by other types. Few restaurant owners still choose to buy in less volume. Although price is not a priority factor in supplier selection, it has a certain influence on the buying behaviours of restaurant owners. If the price is cheaper than usual, they almost never buy more; but if the price is more expensive than usual, some of the restaurant owners

will switch to a cheaper alternative (nearly 17% of respondents) to ensure that the price of food does not increase because they tend to not increase the selling price in the context of competition (FGDs). Generally, prices often rise on festive occasions and at high tourist times (Dien Bien city).

Generally, the owners of restaurants and eateries prefer to use local beef (yellow cattle) because they think that the quality of meat is better (sweet, fragrant, less fat, firmer) than hybrid beef (Sindian hybrid, other hybrids). Especially in the processing of dishes such as dry beef, hybrid beef is usually drier and less tasty than the local beef market (FGD). In addition, some local dishes such as wintry strictly require good quality of beef offal. So, the owners of restaurants and eateries are very careful in the choice of beef for the dishes, especially local dishes.

Table 6. Ability to differentiate beef slaughtered from different breeds.

Item	Casual dining (n=48)	Restaurant (n=12)	Average (n=60)
Can differentiate (%)	37.50	33.33	36.67
Cannot differentiate (%)	62.50	66.67	63.33
Percentage of the respondents preferring local beef over imported beef (%)	58.33	58.33	58.33

Source: Results of the survey on beef consumption in Dien Bien province under the project "Intensification of beef cattle production in upland cropping systems in Northwest Vietnam", 2019.

Despite this, over 50% of restaurant and diner owners said that they cannot distinguish beef by breed origin (Table 6). Besides, with the increase in the use of Korean-style dishes, restaurant and diner owners also use imported beef for processing new dishes. Therefore, not all restaurant and diner owners prefer to use local beef over imported beef. An in-depth interview with a hot pot owner showed that the amount of meat used is mainly imported Australian beef and usually import 2 weights/month from a food company (because supermarkets are more expensive), and used a meat slicer at home. The advantage of the beef is its stickiness, softness, and freshness compared to the local beef; and although more expensive, the restaurant still uses it because it fits their dishes.

3.4. Processing and preservation behaviour

Nearly half of restaurants use fresh beef immediately after buying, mainly for noodles and rice vermicelli cooked for breakfast. In addition, rice shops and restaurants also immediately perform preliminary processing such as marinating to use in

dishes for lunch and dinner customers. The rest is placed in the refrigerator and used always during the same day. The average storage time in the refrigerator is 4-7 h (Table 7).

Table 7. Practice processing and preserving beef at restaurants and casual dining.

Item	Casual dining (n=48)	Restaurant (n=12)	Average (n=60)	P-value
Cook immediately (%)	47.92	25.00	43.33	0.152 ^{NS}
Store in fridge (%)	52.08	75.00	56.67	
Storing time length (hours)	4.46	6.67	4.90	0.179 ^{NS}

Note: NS is not significant at 10% probability level. T-test for average numbers and Chi-square test for relative numbers. Source: Results of the survey on beef consumption in Dien Bien province under the project "Intensification of beef cattle production in upland cropping systems in Northwest Vietnam", 2019.

Dishes made from beef: dishes made from the beef of other restaurants and eateries in Dien Bien are rich (Table 8).

Beef corn is mostly used in stir-fried dishes due to the characteristics of beef raised in the province with a low proportion of interlaced fat. Meanwhile, tenderloin is mainly used for noodle dishes and pho for breakfast. Beef belly is only processed mainly for a wine sauce.

Table 8. Beef dishes of restaurants and casual dining (%).

Processing	Casual dining (n=48)	Restaurant (n=12)	Average (n=60)
<i>Corn</i>			
Pho/noodle	27.27	14.29	25.00
Fry	36.36	42.86	37.50
Fry and hotpot	9.09	28.57	12.50
Other (grilled, steam, boil)	27.27	14.29	25.00
<i>Loin</i>			
Pho/noodle	34.78	60.00	39.29
Fry	26.09	0.00	21.43
Hotpot	4.35	0.00	3.57
Fry and hotpot	8.70	0.00	7.14
Other (grilled, steam, boil)	26.09	40.00	28.57
<i>Bacon</i>			
Fry	16.67	0.00	14.29
Stewed	66.67	100.00	71.43
Other	16.67	0.00	14.29

Source: Results of the survey on beef consumption in Dien Bien province under the project "Intensification of beef cattle production in upland cropping systems in Northwest Vietnam", 2019.

3.5. Some problems for restaurants and food stores in the beef value chain and implications for solutions

In general, restaurants and eateries do not have much difficulty in buying meat materials. The beef supplied to Dien Bien Phu city is provided by the slaughterhouses in the city and the slaughterhouses in the surrounding districts such as Dien Bien district and the beef supplied to Tuan Giao district is from the slaughterhouse in the district. In the town of Tuan Giao, sometimes restaurants and eateries do not buy the desired amount of meat because of the small slaughter scale. In terms of quality, the majority of restaurant owners are satisfied with the current quality of beef, mainly in terms of freshness and cooking quality. The price factor is often mentioned, as restaurant and diner owners claim that the current price of beef is too high, causing the cost to rise and consumers to reduce their demand.

4. Discussion

With a relatively large volume of purchases, casual dining and restaurants are important actors of the beef value chain in Dien Bien province. G.D. Yadata, et al. (2020) [11] indicated that restaurants and eateries consume about 50% of the total beef in the beef value chain in Ethiopia. Those eateries and restaurants also sell raw beef to households. This means that they perform retailing functions and sometimes they also slaughter cattle as well. D. Yuzaria, et al. (2020) [12] also reported that restaurants are one of the three most profitable actors in the beef food chain in Indonesia. In America, restaurants in the beef industry usually are in the group of hamburger or/and fast-food restaurants. Some big brand names are McDonald's, Burger King, and Yum! Brands. It is estimated that about 35 percent of beef consumption by households are eaten at restaurants [13].

Food safety seems to be of less concern among the criteria for selecting suppliers as well as choosing meat, as restaurant owners are more interested in the cooking quality of dishes, although the freshness and smell of beef can also give some information about food safety. In Bangladesh, restaurants typically buy beef only from wholesalers and retailers. Moreover, the important criteria for choosing beef are the quality, size, weight of the carcass, and food safety [14]. B. Novakovic' (2014) [1] also points out that large restaurants and hotels often have specific standards

for beef quality and product packaging. On the other hand, restaurant owners in Dien Bien province do not pay attention to packaging because fresh meat is not packaged, and they prefer to examine raw meat by smelling and touching it (preferably if the meat is still warm and even convulsive). However, as income improves and consumer awareness is increases, food safety will be an issue of concern [15, 16].

Regarding the origin of beef and breed of cattle, customers of restaurants almost never ask about the origin of beef and the breed of cattle, yet restaurant owners prefer indigenous and locally raised cattle. In the UK, the total revenue of restaurants in a year is around £5.4 billion. For example, the customers of the largest steakhouse chain with 250 restaurants nationwide are also less interested in beef origin because they place their trust in quality [17], and they think that quality is closely related to origin [18]. Some other studies show that restaurant owners are willing to pay more for locally produced beef [19, 20]. Even with imported beef, N.N. Mai, et al. (2022) [21] also showed that consumers buying imported beef are interested in information and packaging of product origin. Thus, consolidating the supply of local beef cattle with more reasonable prices, and building linkages from households to slaughterhouses and restaurants to be able to meet quality and traceability, contributes to ensuring food safety.

Dietary change in dining out behaviour using meat-based foods has increased in Vietnam in recent years [22]. In addition, the introduction of outside culinary styles such as Korean and Japanese hot pot dishes also increases the demand for foreign beef. The characteristic of beef prepared in this style is that it is usually tender, with or without fat, and usually does not become tough when cooked for a longer time than local beef. In Vietnam, some foreign beef breeds with quality meat such as imported beef like wagyu or Australian beef can also be researched and developed in order to diversify products and compete with imported meat.

5. Conclusions

Casual dining and restaurants play an important role in the meat value chain in general and the beef value chain in particular. The research results show that in Dien Bien, casual dining and

restaurants are the actors in purchasing fresh beef and creating added value through processing and serving customers. Beef is one of the three main types of meat used in casual dining and restaurants including beef produced locally and imported beef (frozen beef). They often purchase fresh beef daily from slaughterhouses, wholesalers, and retailers and they usually have several suppliers. The relationship with the seller is the most important criterion in the selection of meat suppliers for restaurants and casual dining because it is often built on trust in quantity, quality, and price. The criteria in the beef selection are freshness, stickiness, meat colour, and sometimes the smell of fresh meat. In general, restaurant owners prefer to use local beef over buying elsewhere as they consider the quality of local beef more suitable for preparing dishes. Restaurants use most types of beef for their menus, but most commonly ones are corn, belly, and loin. In general, restaurants do not face many difficulties in sourcing meat, but sometimes they cannot buy the desired amount of meat and are afraid of the receiving buffalo meat instead of beef; as well as want to buy local beef but cannot distinguish between local and other beef. The high price of fresh beef is a problem for them as it increases the cost of doing business and reduces competition. In addition, the trend of changing culinary styles with dishes made from imported beef brings both opportunities and challenges for cattle farmers in Dien Bien province. Solutions to upgrade the beef value chain in Dien Bien include developing the local supply of beef with lower prices and higher quality, building linkages among value chain actors to ensure quality and gradual traceability, and implementing research on cattle breeds with more diverse meat quality attributes for changing culinary needs.

CRedit author statement

Bui Van Quang: Writing - Original draft preparation, Data curation and Editing; Nguyen Thi Duong Nga: Conceptualisation, Methodology, Writing - Reviewing; Pham Van Hung: Reviewing and Editing; Duong Nam Ha: Reviewing and Editing; Tran The Cuong: Investigation; Han Anh Tuan: Investigation; Le Thi Thanh Huyen: Investigation; Stephen Ives: Reviewing and Commenting.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] B. Novakovic¹ (2014), *Analysis of Value Chain for Meat and Meat Products*. Enterprise Development Agency Eda, Banjaluca Publisher, 53pp.
- [2] M. Ijaz, M.K. Yar, I.H. Badar, et al. (2021), "Meat production and supply chain under COVID-19 scenario: Current trends and future prospects", *Frontiers in Veterinary Science*, **8**, DOI: 10.3389/fvets.2021.660736.
- [3] G. Gereffi, J. Lee (2009), "A global value chain approach to food safety and quality standards", *Global Health Diplomacy for Chronic Disease Prevention Working Paper Series*, 51pp.
- [4] J. Dzanja, P. Kapondamgaga, H. Tchale (2013), "Value chain analysis of beef in central and southern Malawi (Case studies of Lilongwe and Chikhwawa districts)", *International Journal of Business and Social Science*, **4(6)**, pp.92-102.
- [5] U.S. Agency for International Development (2018), "Assessment of livestock value chain/market systems", *Final Report*, https://pdf.usaid.gov/pdf_docs/PA00TQ9T.pdf, accessed 25 October 2022.
- [6] Safefood (2008), "A review of the beef food chain", *Summary Document*, 17pp, [https://www.safefood.net/getmedia/abd4d38b-579f-49c7-8d1b-48067cb7cae8/Safefood_8202_A5_Beef_Summary-20\(2\).aspx?ext=.pdf](https://www.safefood.net/getmedia/abd4d38b-579f-49c7-8d1b-48067cb7cae8/Safefood_8202_A5_Beef_Summary-20(2).aspx?ext=.pdf), accessed 25 October 2022.
- [7] General Statistics Office of Vietnam (2023), *Statistics on Beef Cattle Population by Provinces* (in Vietnamese).
- [8] S. Ives, V.C. Cuong, P. Lane, et al. (2018), "Overcoming technical and market constraints to the emergence of profitable beef enterprises in the north-western highlands of Vietnam", *Final Report*, Australian Centre for International Agricultural Research, Canberra, 73pp.
- [9] B.V. Quang, N.T.D. Nga (2020), "Studies on the beef value chain in Tuan Giao district, Dien Bien province", *Vietnam J. Agri. Sci.*, **18(1)**, pp.73-80 (in Vietnamese).
- [10] I. Etikan, S.A. Musa, R.S. Alkassim (2016), "Comparison of convenience sampling and purposive sampling", *American Journal of Theoretical and Applied Statistics*, **5(1)**, pp.1-4, DOI: 10.11648/j.ajtas.20160501.11.
- [11] G.D. Yadata, A. Gemechu, A. Mitiku (2020), "Beef cattle value chain map in Nono Benja distirict, Jimma zone, Oromia regional state, Ethiopia", *Journal of Biology, Agriculture and Healthcare*, **10(11)**, pp.1-13, DOI: 10.7176/JBAH/10-11-01.
- [12] D. Yuzaria, B. Basyar¹, R. Khairati (2020), "The analysis of value chain of beef cattle partnership business based on financial technology", *American Journal of Animal and Veterinary Sciences*, **15(1)**, pp.48-58, DOI: 10.3844/ajavsp.2020.48.58.
- [13] M. Lowe, G. Gereffi (2009), "A value chain analysis of the U.S. beef and dairy industries", *Report Prepared for Environmental Defense Fund*, 55pp.
- [14] M.G. Kok, J.M. Soethoudt, D.M. Vernooij, et al. (2021), "Analysis of the beef value chain in Bangladesh", *Towards a Strategic Action Agenda for The Dhaka City Corporations, Wageningen Food and Biobased Research*, 49pp, <https://edepot.wur.nl/557278>, accessed 25 October 2022.
- [15] L.D.A. Zanetta, R.M.D. Mucinhato, M.P. Hakim, et al. (2022), "What motivates consumer food safety perceptions and beliefs? A scoping review in BRICS countries", *Foods*, **11(3)**, DOI: 10.3390/foods11030432.
- [16] E. Zhllima, D. Imami, M. Canavari (2015), "Consumer perceptions of food safety risk: Evidence from a segmentation study in Albania", *Journal of Integrative Agriculture*, **14(6)**, pp.1142-1152, DOI: 10.1016/S2095-3119(14)60997-7.
- [17] M. Francis, D. Simons, M. Bourlakis (2008), "Value chain analysis in the UK beef foodservice sector", *Supply Chain Management*, **13(1)**, pp.83-91, DOI: 10.1108/13598540810850346.
- [18] K.A. Varnold, C.R. Calkins, B.L. Gordon, et al. (2011), "Importance of steak origin to restaurant customers", <https://beef.unl.edu/b11eefdf-8342-4eda-8290-7e873ffc5d7c.pdf>, accessed 6 December 2022.
- [19] L.C. McKay, K.L. DeLong, K.L. Jensen, et al. (2019), "Estimating restaurant willingness to pay for local beef", *Agribusiness*, **35**, pp.610-624, DOI: 10.1002/agr.21605.
- [20] A. Sharma, J. Moon, C. Strohbehm (2014), "Restaurant's decision to purchase local foods: Influence of value chain activities", *International Journal of Hospitality Management*, **39**, pp.130-143, DOI: 10.1016/j.ijhm.2014.01.009.
- [21] N.N. Mai, D.Q. Giam, D.V. Vien (2022), "Factors influencing imported beef purchase intention: A case study in Long Bien district, Hanoi, Vietnam", *Vietnam Journal of Agricultural Sciences*, **5(1)**, pp.1408-1423, DOI: 10.31817/vjas.2022.5.1.08.
- [22] J. Harris, P.H. Nguyen, L.M. Tran (2020), "Nutrition transition in Vietnam: Changing food supply, food prices, household expenditure, diet and nutrition outcomes", *Food Sec.*, **12**, pp.1141-1155, DOI: 10.1007/s12571-020-01096-x.

Determinant factors influencing smartphone customer's brand loyalty in Ho Chi Minh city

Nguyen Thi Hong Nguyet*

Ho Chi Minh University of Natural Resources and Environment, 236 Le Van Sy Street, Ward 1, Tan Binh District, Ho Chi Minh City, Vietnam

Received 7 November 2022; revised 18 January 2023; accepted 6 February 2023

Abstract:

Plenty of research on brand loyalty has been conducted through various products around the world and in Vietnam as well. However, there has not yet been a research model established for smartphone consumer brand loyalty in the Ho Chi Minh city market. Therefore, this paper aims to examine factors that impact customer brand loyalty in the smartphone market in Ho Chi Minh city. The model consists of social influence, self-expressive value, perceived quality, perceived price, and their impact on brand loyalty. A sample of 325 smartphone consumers was analysed to evaluate Cronbach's alpha reliability coefficient, and exploring factor analysis, and conduct multiple linear regression (MLR) using SPSS software 22.0. The findings indicated that four independent variables impacted the one dependent variable - brand loyalty. The research results also showed that perceived quality and perceived price were the two main factors influencing brand loyalty for smartphone consumers. From this research, managers can conduct marketing programs that encompass oriented self-expressive values related to quality, and price, while creating activities that enhance social influence to enrich consumer brand loyalty.

Keywords: brand loyalty, perceived price, perceived quality, self-expressive value, smartphone consumer, social influence.

Classification numbers: 2.3, 4.1

1. Introduction

The smartphone market is a strong growing market in Vietnam and is considered to have the highest growth rate in Southeast Asia [1]. This has attracted many international smartphone brands, such as Apple, Xiaomi, Samsung, Oppo, and Vivo, looking to enter the industry in the Vietnamese market. Smartphone volume sales in Vietnam reached 15.9 million units with a growth of 11.9% in 2021 (Table 1). The IDC forecasts that smartphone growth in 2022 will reach 22%, which is almost double from last year [2].

To survive in such a highly competitive and globalised market, businesses must find ways to maintain old customers and attract new customers with priority placed on long-term customer retention solutions. M. Mellens, et al. (1996) [3] argued that maintaining ongoing customers in the long term is a survival task for managers. D.A. Aaker (1996) [4] discussed that loyal consumers bring many benefits to enterprises, for example, by reducing costs, increasing sale volume (especially new products from the same brand), and by providing more time to respond to

Table 1. Smartphone market share in Ho Chi Minh city in 2021 [2].

Company	2021 shipments	2021 market share	2020 shipments	2020 market share	YoY growth
1. Samsung	5.3	33.3%	4.2	29.3%	27.1%
2. OPPO	2.8	17.5%	2.7	19.1%	2.3%
3. Xiaomi	2.0	12.7%	1.2	8.3%	70.9%
4. Vivo	1.9	11.7%	1.4	10.1%	29.4%
5. Apple	1.4	8.9%	0.9	6.0%	66.2%
Others	2.5	15.9%	3.9	27.1%	-34.5%
Total	15.9	100.0%	14.2	100.0%	11.9%

Vietnam smartphone market, Top 5 company shipments, market share, and YoY growth, 2021 (shipments in millions). Source: IDC quarterly mobile phone tracker, the 4th quarter 2021.

competitive threats. Prior study has confirmed that loyal customers not only readily spend significant amounts of money for brands they love, more so than non-loyal customers, but also, such customers introduce the brand through personal relationships such as friends, colleagues, and family members [5]. L.J. Rosenberg, et al. (1983) [6] indicated that expenditure to attract and win a new customer is six times higher than the expenditure of retaining an

*Email: nthnguyet@hcmunre.edu.vn

existing customer. Therefore, increasing customer's brand loyalty is the most important and necessary strategy of a successful business.

There have been a large number of brand loyalty studies conducted under different markets and market conditions. However, very few studies have investigated factors affecting the brand loyalty of smartphone consumers in the Ho Chi Minh city market in recent years. Moreover, there has not yet been study of factors like self-expressive value, perceived quality, perceived price, and social influence that affect smartphone brand loyalty in one model. Therefore, this study explores the self-expressive value, social influence, perceived quality, and perceived price impact on brand loyalty of smartphone consumers in the Ho Chi Minh city market in order to help marketing managers in the smartphone industry enhance their brand loyalty.

2. Literature review

Branding is a complex concept and there is no consensus on the definition. The popular brand concept, which is accepted by most researchers, is an integrated perspective. Brand is not only a name [7], but it also includes many different aspects to meet target customers' diverse requirements. From an integrated perspective, product, price, place, and promotion are a part of the brand only [8]; and a brand provides both functional and emotional benefits.

In marketing literature, loyalty is the retention of repeat purchases of a particular brand's products or services even though competitive brands offering attractive benefits [9]. Loyalty itself indicates both attitude and behaviour [10]. Brand loyalty attitude represents consumers' active support in purchasing intention, and brand loyalty behaviour implies priority in searching for a preferred brand, repurchasing a brand, and brand positive word-of-mouth. J. Jacoby, et al. (1978) [11] stated that brand loyalty comprises six dimensions, namely biased, behavioural response, expression during long periods, impacts of marketing strategies, related to choosing a brand or alternative brands, and to be a function of decision-making processes. Brand loyalty shows customer satisfaction and trust in the brand. When customers are satisfied and have trust in the brand, they make a commitment to engage with the brand for a long time. Therefore, brand loyalty is an important factor to build up brand

equity. In the other words, brand loyalty plays a crucial role in the existence of enterprise. Hence, research on brand loyalty as well as exploring the factors affecting brand loyalty is necessary.

3. Hypothesis development

3.1. Self-expressive value and brand loyalty

People always want to be identified as part of a specific group, i.e., as a member of a society [12]. In order to help themselves be accepted as a member of one group or another, they often tend to express themselves in the process of looking for similar groups to become a member. This requires the individual to expose some of his or her characteristics to the out-side. The simplest way to be easily identified in a crowded community is by using a brand because a particular brand often has distinct and specific personalities. In the other words, a brand can help people to express himself. A researcher confirmed that a brand is really attractive when it help people to express themselves. Managers are aware the important role of brand personality in an effective marketing campaign, so they add brand personality values, which are communicated to customers to become more and more popular [13-15]. Moreover, J.L. Aaker (1997) [15] pointed out that brand personality influence on consumers' attitude while C.K. Kim, et al. (2001) [12] indicated that the self-expressive value of brand personality has impacts on brand loyalty. These findings imply that customer tend to choose a brand that has a brand personality reflective of his or her own personality, and will thus be loyal to this brand. Furthermore, more and more people, especially youths like and consider self-expression as a new lifestyle trend, and they usually express themselves through familiar objects such as clothes, motorcycles, and smartphone. Based on these arguments, the self-expressive value of brands may influence a smartphone consumer's brand loyalty. Therefore, the author suggests the following hypothesis:

H1: Self-expressive value has a positive impact on brand loyalty.

3.2. Perceived quality and brand loyalty

Perceived quality is a customer's evaluation about the specific product or service [16]. V.A. Zeithaml (1988) [5] argued that product quality comprises performance, features, reliability, durability,

serviceability, conformance with specifications, and fit and finish. Meanwhile, service quality dimensions consist of tangibles, reliability, competence, responsiveness, and empathy. A successful brand can offer good product quality as well as related services. As a consequence, when customers evaluate perceived quality of a brand, they have to consider to multiple dimensions. Because customers can be affected by differentiation in a demographic, the customer has their own perceived quality about a brand even though at different points in time one person could also have a different point of view about the same brand. The perceived quality of the brand is therefore a subjective customer' overview evaluation, and it has an effect to their purchasing behaviour. Previous researchers have show that perceived quality of a brand has impacts on brand loyalty [15, 17]. Moreover, smartphones are an essential tool that help people save personal information and conduct regular, efficient online transactions in modern life. Therefore, a customer's perceived quality about a smartphone brand is a main factor that influences on their purchase making decisions as well as loyalty with that brand. Thus, the authors propose the following second hypothesis:

H2: Perceived quality positively impacts brand loyalty.

3.3. Perceived price and brand loyalty

Perceived price implies a customer's assessment about brand value and the product's ability to meet their needs and expectations. Perceived price depends on real price and consumer's reference price [18]. According to T.Z. Chang, et al. (1994) [19], perceived price positively affects the real price of a brand and has a negative influence on the reference price. Expenditure and opportunity cost are antecedent variables that impact on perceived price, while perceived price influences perceived value and brand loyalty [20]. Moreover, B. Yoo, et al. (2000) [21] also confirmed that perceived price affects brand loyalty. In general, income earned by most Vietnamese is not high and price is a main factor that consumers consider when choosing a specific brand. Thus, Vietnamese consumers have a special interest in the price of the smartphone brand that they consume. Based on the above-mentioned arguments, third hypothesis is proposed.

H3: Perceived price has positive impacts on brand loyalty.

3.4. Social influence and brand loyalty

Social influence imparts social pressure on peer groups [22], norms [23], cultural values [24], friends and family [25], persuasion conformity [26], friend on social media [27], and subjective norms. Subjective norms are manifestations of individual behaviours from social pressure [28]. Therefore, social influence can be measured through subjective norms. I. Ajzen, et al. (1980) [29] confirmed that subjective norms are an important factor determining the social influence on consumers' behaviour. Social influence is an important factor in helping people interact with each other with similar behaviours or it is a foundation of conditions for individuals to assert themselves. Thus, social influence can be the driving force influencing a change of customers' brand choice. Most of the research on purchase intention to date has focused on one certain motive: the tendency to align with valued reference groups [30]. H.N. Dang (2013) [27] argued that consumers make decisions depending on well-known people in society or by choosing a brand from social pressure. The social influence element has been investigated in different contexts and confirmed in various sectors [31]. J. Berger, et al. (2008) [32] indicated that social influence is an important factor that influence consumer's choice through buying or not buying a specific brand. Therefore, brand loyalty of smartphone consumers may be impacted by social influence.

H4. Social influence has significant positive influence on brand loyalty.

The research model of this paper is presented in Fig. 1.

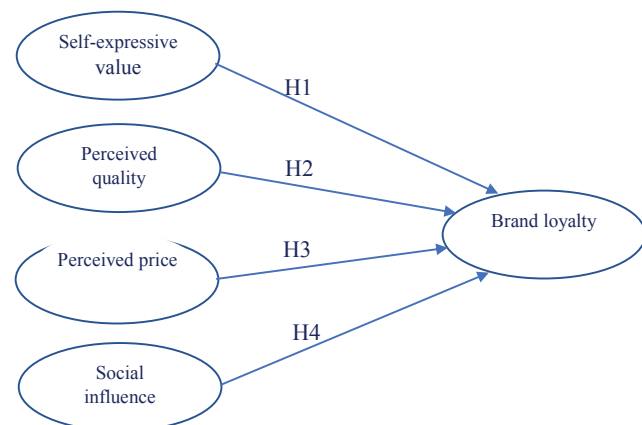


Fig. 1. Research model.

4. Methodology

This study applies mix methods concluding both qualitative and quantitative research. The quantitative research was the main study, which was conducted in Ho Chi Minh city with a convenience sample method. Although the convenience sampling method has many limitations in reliability, it is suitable in this study because of limited resources. The questionnaires were delivered to smartphone consumers by face-to-face interview and a Google doc form. The Cronbach's alpha, exploring factor analysis, and MLR analysis were applied to assess the measurements and testing model.

4.1. Sample size

Sample size is an important element in order to meet the requirements of research standards. Sample size must meet accuracy and representative results to ensure no systematic bias in variance and confirm an acceptable sampling error [33]. J.F. Hair, et al. (1998) [34] argued that a good sample size should be at least 15 observations per item. Additionally, S. Uma, et al. (2009) [35] recommended a sample size between 30 to 500 units. Therefore, the 327 valid questionnaires analysed in this study were appropriate.

4.2. Measurements

Self-expressive value of brand personality was adopted by C.K. Kim, et al. (2001) [12]. Measurement scales for perceived quality factor were developed by other researcher [21, 36]. Perceived price was adjusted by B. Yoo, et al. (2000) [21]. Social influence measurements were developed by J.R. Chevron (1998) [37]. Brand loyalty was measured by five observed variables, and the qualitative research results.

5. Results

5.1. Characteristics

Description of data analysis: A total number of 384 questionnaires were delivered and there was a total of 352 respondents. There were 27 respondents that did not meet the requirements of the study because

of un-answered questions, missing information, similar answers, or dishonest answers. The rest of the 325 valid questionnaires were analysed, and the characteristics of the survey sample are presented in Table 2 below.

Table 2. Sample characteristics.

Sample characteristics		Frequencies	Count (%)
Brand name using	Samsung	124	38.15
	iPhone	94	28.92
	Oppo	48	14.77
	Readme	37	11.38
	Others	22	6.78
Age groups	Under 22 years old	159	48.92
	23 to 30 years old	83	25.54
	31 to 40 years old	72	22.15
	Over 40 years old	11	3.39
Income groups	Under 5 million VND	125	38.46
	5.1 to 10 million VND	114	35.08
	Over 10 million VND	86	26.46
Total		325	100

Source: Results of the survey for factors affecting the brand loyalty of customers in using smartphones in Ho Chi Minh city, 2022.

The frequency analysis results indicated that Samsung was the most used brand name with 38.15%. The next were iPhone, Oppo and Readmi (making up 28.92, 14.77, and 11.38%, respectively). Other smartphone brand names such as LG, and Motorola made up 6.78% of the research sample collectively. Demographical analysis illustrated that the age group under 22-year-old contributed 48.92%, while the second largest age group contributed 25.54% at 23 to 30 years old. In terms of income, the three income groups have nearly the same percentage.

5.2. Measurement validation

The Cronbach's alpha reliability analysis and results of exploring factor analysis are presented in Tables 3 and 4.

Table 3. Cronbach's alpha reliability analysis.

Items	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Alpha if item deleted
Self-expressive (SE) value (Alpha=0.8339)				
X helps me to express my style (SE1)	24.063	47.586	.617	.7319
X reflects my personality (SE2)	24.621	47.715	.591	.7242
X helps me remarkable (SE3)	24.342	45.656	.606	.6096
X confirms my position and class (SE4)	24.804	44.324	.712	.6187
X helps me to express my profession (SE5)	24.739	46.829	.593	.7442
Perceived quality (PQ) (Alpha=0.6392)				
X has many designs and colours to choose (PQ1)	14.978	10.273	.447	.696
X's colour and design are impressive (PQ2)	14.646	11.393	.402	.615
X has a strong configuration (PQ3)	14.368	11.749	.382	.649
X has good quality (PQ4)	14.597	11.532	.441	.652
Perceived price (PP) (Alpha=0.6824)				
X's price is reasonable (PP1)	10.480	6.409	.612	.641
X's price is high competition (PP2)	10.567	6.165	.609	.673
In generally, you satisfy with X's price (PP3)	10.832	6.724	.564	.757
Social influence (SN) (Alpha=0.742)				
My family has impacted on my decision to choose smartphone brand (SN1)	10.430	6.449	.652	.691
My relatives and colleges have impacted on my smartphone brand choice (SN2)	10.865	6.705	.607	.682
News on mass media has influenced on my smartphone brand choice (SN3)	10.567	6.723	.561	.723
Smartphone advertisements on social media have affected on my smartphone brand choice (SN4)	10.419	6.723	.561	.723
Brand loyalty (BL) (Alpha=0.7075)				
X always is my first choice (BL1)	22.867	51.306	.683	.714
I suppose that I am a loyal consumer (BL2)	22.342	51.332	.523	.753
I will continue to use X because I am satisfied and acquainted with X (BL3)	22.509	49.409	.564	.634
I will use X despite competitors' deals (BL4)	22.726	51.017	.648	.742
I usually recommend X to others (BL5)	22.193	49.269	.701	.702

Source: Results of the survey for factors affecting the brand loyalty of customers in using smartphones in Ho Chi Minh city, 2022.

Table 4. Exploring factor analysis results.

Observed variables	Loading factors				
	1	2	3	4	5
SE1	.806				
SE2	.819				
SE3	.762				
SE4	.704				
SE5	.826				
PQ1		.794			
PQ2		.802			
PQ3		.731			
PQ4		.863			
PP1		.796			
PP2			.816		
PP3			.754		
SN1			.831		
SN2			.749		
SN3				.871	
SN4				.852	
BL1				.764	
BL2				.703	
BL3					.782
BL4					.806
BL5					.794

Source: Results of the survey for factors affecting the brand loyalty of customers in using smartphones in Ho Chi Minh city, 2022.

5.3. Testing hypotheses

After refining the scales and testing all the assumptions, MRL was conducted, using SPSS software 22.0. The MRL analysis results indicated that the adjusted R^2 of the regression coefficient was 0.407 meaning this model could explain 40.7% of the fluctuation of the brand loyalty variable only. The ANOVA results showed that the F-value was 34.572 at Sig. 0.000. This means the null hypotheses were rejected, and the model fit with 95% of the data.

In summary, all hypotheses were significant. In other words, all four factors had affected to brand loyalty of smartphone users (i.e., the beta coefficients were positive), and their affected rate to brand loyalty

was represented by a simple formula following:

$$BL = 0.325PQ + 0.268PP + 0.201SE + 0.173SN$$

The detail results of the survey data processing are illustrated in Table 5.

Table 5. Hypothesis testing coefficients.

Model	Unstandardised coefficients		Standardised coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	1.536E-16	.039		.000	1.000
SE	.201	.039	.201	3.982	.004
PQ	.325	.039	.325	5.063	.000
PP	.268	.039	.268	7.414	.000
SN	.173	.039	.173	6.821	.000

Source: Results of the survey for factors affecting the brand loyalty of customers in using smartphones in Ho Chi Minh city, 2022.

6. Discussion

The beta value of the standardised coefficient of perceived quality was 0.325, perceived price: 0.268, self-expressive value: 0.201, and social influence: 0.173, which showed the influence level of these factors on brand loyalty. From the results, it was found that a combination of all these factors played an important role in explaining brand loyalty. These results are in line with those of B. Yoo, et al. (2000) [21], and N.D. Tho, et al. (2007) [17].

Among the independent factors, perceived quality had the highest impact on brand loyalty. This makes sense because, as explained in the literature review, perceived quality played an important role in purchase decisions. So, consumers seriously considered a smartphone brand based mainly on perceived quality.

7. Conclusions and implications

7.1. Theoretical implications

Plenty of research on brand loyalty has been conducted through various products around the world and in Vietnam as well. However, there has not yet been a research model established for smartphone consumer' brand loyalty in the Ho Chi Minh city market. The most important contribution of this study is to determine the impact of self-expressive value, perceived quality, perceived price, and social influence on brand loyalty. Next, the key point of this

research stresses that the strength of the relationship between the above-mentioned antecedents and brand loyalty in different categories will vary. Another theoretical implication is that different types of products have different combinations of antecedents. This research proves that a combination of many factors strongly affects on brand loyalty not one or two single constructs.

7.2. Managerial implications

The researcher proposes brand managers to consider the affecting factors and their levels on brand loyalty. It is very important for them to make an effective and suitable brand strategy to improve consumer' loyalty. Based on the research results, here are some recommendations to smartphone brand managers:

The research found that perceived quality is the main factor affecting consumer brand loyalty. Therefore, smartphone managers should focus most of their resources on improving product quality. Accordingly, the director can innovate production technology, produce new designs that are more convenient, supplement other necessary features, increase operational efficiency, and create other new values to enhance the customer experience. In addition, managers should also offer long-term warranties and excellent support services for customers to guarantee service and product quality.

Perceived price is the second most important factor influencing smartphone consumers' brand loyalty. Thus, managers should choose an appropriate pricing method based on customer benefits, competitiveness, and expected profits of the investors. Besides this, managers should pay attention to psychological pricing techniques by choosing odd numbers to encourage feelings of low price. Furthermore, managers should also consider implementing direct price reduction programs in promotion campaigns.

Self-expressive value is the third-most important factor affecting consumers' brand loyalty in the smartphone context. Hence, managers should build up expressive values during the brand personalization process for smartphone branding. Brand personality plays an important role in creating positive feelings in the consumer. There are five popular brand personalities including sincerity, excitement,

competence, sophistication, and ruggedness [15]. Therefore, managers can consider a suitable brand personality to attribute to their brand in order to attract consumers.

Social influence is the least important factor affecting brand loyalty of smartphone consumers in this study. However, successful managers should pay attention to culture, family, colleagues and close relatives during advertising on mass media because they do have impact on consumer decision making. Therefore, managers should offer services and product quality of a brand that are suitable not only for consumers' desires but also for stakeholders and their relationships.

8. Study limitations

This study has several limitations although this work has many contributions. *First*, most samples in this study are young students in some universities in Ho Chi Minh city. Thus, further research should expand to smartphone users from different sectors. *Second*, target smartphone consumers in this paper are only currently using smartphone consumers. Hence, it is necessary to consider adding used smartphone consumer samples and even include non-users of smartphones who have purchasing intention in future. *Finally*, this paper has a limited research model. This research model only considered self-expressive value, perceived quality, perceived price, and social influence affecting brand loyalty. However, there are other factors that may impact brand loyalty of smartphone consumers. Therefore, in further studies, the author will investigate other antecedents of brand loyalty in the smartphone market such as prestige brand, brand awareness, brand trust, and so on.

COMPETING INTERESTS

The author declares that there is no conflict of interest regarding the publication of this article.

REFERENCES

[1] C. Sang (2015), *Brands Vietnam*, <https://www.brandsvietnam.com/7126-Thi-truong-smartphone-Viet-Nam-Du-rong-cho-tat-ca>, accessed 26 October 2022 (in Vietnamese).

[2] T. Tran (2022), *Vietnamnet*, <https://vietnamnet.vn/thi-truong-smartphone-viet-xiaomi-apple-tang-truong-manh-i406526.html>, accessed 2 November 2022 (in Vietnamese).

[3] M. Mellens, M.G. Dekimpe, J.B.E.M. Steeniump (1996), "A review of brand loyalty measures in marketing", *Tijdschrift voor Economie en Management*, **XLI(4)**, pp.507-533.

[4] D.A. Aaker (1996), *Building Strong Brands*, The Free Press, New York, 380pp.

[5] V.A. Zeithaml (1988), "Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence", *Journal of Marketing*, **52(3)**, pp.2-22, DOI: 10.1177/002224298805200302.

[6] L.J. Rosenberg, J.A. Czepliel (1983), "A marketing approach to customer retention", *Journal of Consumer Marketing*, **1(2)**, pp.45-51, DOI: 10.1108/eb008094.

[7] S. Davis (2002), "Implementing your BAM Strategy: 11 steps to making your brand a more valuable business asset", *Journal of Consumer Marketing*, **19(6)**, pp.503-513, DOI: 10.1108/07363760210444878.

[8] T. Ambler, C. Styles (1996), "Brand development versus new product development: Towards a process model of extension", *Marketing Intelligence and Planning*, **14(7)**, pp.10-19, DOI: 10.1108/02634509610152664.

[9] R.L. Olive (1999), "Whence customer loyalty", *Journal of Marketing*, **63(SI)**, pp.33-44, DOI: 10.2307/1252099.

[10] D. Ball, P.S. Coelho, A. Machas, et al. (2004), "The role of communication and trust in explaining customer loyalty: An extension to the ECSI model", *European Journal of Marketing*, **38**, pp.1272-1293, DOI: 10.1108/03090560410548979.

[11] J. Jacoby, R.W. Chestnut (1978), *Brand Loyalty: Measurement and Management*, John Wiley and Sons, New York, 157pp.

[12] C.K. Kim, D. Han, S.B. Park (2001), "The effect of brand personality and brand identification on brand loyalty: Applying the theory of social identification", *Japanese Psychological Research*, **43(4)**, pp.195-206, DOI: 10.1111/1468-5884.00177.

[13] J.T. Plummer (2000), "How personality makes a difference", *Journal of Advertising Research*, **40(6)**, pp.79-83, DOI: 10.2501/JAR-40-6-79-83.

[14] D.A. Aaker, A.L. Biel (1993), "The brand personality component of brand goodwill: Some antecedents and consequences", *Brand Equity and Advertising*, Psychology Press, 14pp.

[15] J.L. Aaker (1997), "Dimensions of brand personality", *Journal of Marketing Research*, **34(3)**, pp.347-356, DOI: 10.2307/3151897.

[16] P.E. Earl, S. Kemp, Eds. (1998), *The Elgar Companion to Consumer Research and Economic Psychology*, Edward Elgar Publishing, Northampton, 672pp.

[17] N.D. Tho, N.T.M. Trang (2007), *Marketing Science Research - Applying SEM Linear Structure Modeling*, Labour Publishing House, Ho Chi Minh City, 487pp (in Vietnamese).

- [18] S.L. Winer (1986), "The role of exchange rate flexibility in the international transmission of inflation in long and shorter runs: Canada, 1953 to 1981", *Canadian Journal of Economics*, **19(1)**, pp.62-86, DOI: 10.2307/135171.
- [19] T.Z. Chang, A.R. Wildt (1994), "Price, product information, and purchase intention: An empirical study", *Journal of the Academy of Marketing Science*, **22(1)**, pp.16-27, DOI: 10.1177/0092070394221002.
- [20] M.J. Alhabeeb (2002), "A conceptual scheme for consumer perceptions of product quality, value, and price", *Academy of Marketing Studies Journal*, **18(1)**, pp.1-7.
- [21] B. Yoo, N. Donthu, S. Lee (2000), "An examination of selected marketing mix elements and brand equity", *Journal of The Academy of Marketing Science*, **28(2)**, pp.195-215, DOI: 10.1177/0092070300282002.
- [22] I.I. Ibrahim, K.A. Subari, K.M. Kassim, et al. (2013), "Antecedent stirring purchase intention of smartphone among adolescents in Perlis", *International Journal of Academic Research in Business and Social Sciences*, **3(12)**, DOI: 10.6007/IJARBS/V3-I12/415.
- [23] S. Vahabzadeh, S.S. Duneghe, T.A. Khachoei (2014), "A study of the factors influencing dependency, and its effect on the purchase behavior of the Iranian consumers of smartphone", *Switzerland Research Park Journal*, **103(2)**, pp.1120-1132.
- [24] K.L.L. Yee, K.S. Han, B.C. Yin-Fah (2013), "Factor affecting smartphone purchase decision among Malaysian generation Y", *International Journal of Asian Social Science*, **3(12)**, pp.2426-2440.
- [25] R. Rajagopal (2011), "Consumer culture and purchase intentions towards fashion apparel in Mexico", *Journal of Database Marketing and Customer Strategy Management*, **18(4)**, pp.286-307, DOI: 10.1057/dbm.2011.33.
- [26] N.M.M. Mothar, M.B.A. Hassan, M.S.B.H. Hassan, et al. (2013), "The importance of smartphone's usage among Malaysian undergraduates", *IOSR Journal of Humanities and Social Science*, **14(3)**, pp.112-118, DOI: 10.9790/1959-143112118.
- [27] H.N. Dang (2013), *Exploring The Factors Affecting Purchase Intention of Smartphone: A Study of Office Workers in Ho Chi Minh City*, Master thesis, Vietnam National University Ho Chi Minh City (in Vietnamese).
- [28] C.C. Teng, Y.M. Wang (2015), "Decisional factors driving organic food consumption: Generation of consumer purchase intentions", *British Food Journal*, **117(3)**, pp.1068-1081, DOI: 10.1108/BFJ-12-2013-0361.
- [29] I. Ajzen, M. Fishbein (1980), *Understanding Attitudes and Predicting Social Behavior*, Prentice Hall, 278pp.
- [30] R.R. Petty, D.T. Wegener (1998), "Attitude change: Multiple roles for persuasion variables", *The Handbook of Social Psychology*, McGraw Hill, pp.323-390.
- [31] R.B. Cialdini, M.R. Trost (1998), "Social influence: Social norms, conformity, and compliance", *The Handbook of Social Psychology*, McGraw Hill, pp.151-192.
- [32] J. Berger, C. Heath (2008), "Who drives divergence? Identity signaling, outgroup dissimilarity, and the abandonment of cultural tastes", *J. Pers. Soc. Psychol.*, **95(3)**, pp.593-607, DOI: 10.1037/0022-3514.95.3.593.
- [33] R.C. Donald, S.S. Pamela (2003), *Business Research Methods*, 8th edition, Mc Graw-Hill/Irwin, New York, 857pp.
- [34] J.F. Hair, R. Anderson, R. Tatham, et al. (1998), *Multivariate Data Analysis*, 5th edition, Prentice Hall, 730pp.
- [35] S. Uma, B. Roger (2009), *A Skill Building Approach - Research Methods for Business*, 7th edition, Wiley Publisher, 447pp.
- [36] W.B. Dodds, K. Monroe, D. Grewal (1991), "Effects of price, brand, and store information on buyers' product evaluations", *Journal of Marketing Research*, **28(3)**, pp.307-319, DOI: 10.2307/3172866.
- [37] J.R. Chevron (1998), "The Delphi process: A strategic branding methodology", *Journal of Consumer Marketing*, **15(3)**, pp.254-264, DOI: 10.1108/07363769810219125.

Government pandemic policies associated with vaccine fund and vaccine diplomacy in response to COVID-19: A critical study of the Vietnamese experience

Quy Van Khuc^{1*}, Shawn Leu², Hien Nguyen³, Thang Ngo³, Nguyen Truc Le¹, Thuy Nguyen⁴, Hoang Khac Lich⁵, Thi-Hong Nguyen⁶, Nguyen Thuy Anh⁷, Duc-Bao Nguyen⁷, Phuong Luu³, Le Thanh Ha³, Nguyen Duc Lam⁸, Phu Pham^{4,9}, Trung Tran¹⁰

¹Faculty of Development Economics, University of Economics and Business, Vietnam National University - Hanoi (VNU), 144 Xuan Thuy Street, Dich Vong Hau Ward, Cau Giay District, Hanoi, Vietnam

²UNE Business School, University of New England, Armidale, New South Wales 2351, Australia

³Department of Economics, National Economic University, 207 Giai Phong Street, Dong Tam Ward, Hai Ba Trung District, Hanoi, Vietnam

⁴Vietkap, Trung Cao Village, Chuong My District, Hanoi, Vietnam

⁵Personnel Department, University of Economics and Business, VNU, 144 Xuan Thuy Street, Dich Vong Hau Ward, Cau Giay District, Hanoi, Vietnam

⁶Faculty of International Economics, Foreign Trade University, 91 Chua Lang Street, Lang Thuong Ward, Dong Da District, Hanoi, Vietnam

⁷Faculty of Political Economy, University of Economics and Business, VNU, 144 Xuan Thuy Street, Dich Vong Hau Ward, Cau Giay District, Hanoi, Vietnam

⁸Department of Scientific Research and Development Cooperation, University of Economics and Business, VNU, 144 Xuan Thuy Street, Dich Vong Hau Ward, Cau Giay District, Hanoi, Vietnam

⁹Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, 8 Hoang Quoc Viet Street, Nghia Do Ward, Cau Giay District, Hanoi, Vietnam

¹⁰School of Civil and Environmental Engineering, University of Ulsan, 93 Daehak-Ro Street, Nam-Gu District, Ulsan City, Korea

Received 10 November 2022; revised 23 January 2023; accepted 3 February 2023

Abstract:

Since the onset of the COVID-19 pandemic, Vietnam has experienced four coronavirus waves. While the government was able to bring the first three outbreaks under control, the fourth outbreak has been causing rampant health, economic, and social problems in Vietnam. This study contributes to the literature by conducting a systematic and critical analysis on how the Vietnamese government responds to the COVID-19 pandemic. We review a large number of policy documents issued by the central and provincial authorities over a two-year period from January 2020 to March 2022. Early success in pandemic control can be attributed to proactive communication to raise public awareness, strong contact tracing technology, and timely public health and economic policy measures. Vaccine diplomacy and the establishment of the Vaccine Fund represents a turning point in the pandemic campaign and demonstrates that Vietnam is capable of applying the formula of Vaccine + the 5 Ks: Khẩu trang (face mask), Khoảng cách (keeping a safe distance), Khử khuẩn (disinfection), Không tập trung đông người (do not gather in crowded places), and Khai báo y tế (health declaration), which gives Vietnam the best chance to vanquish COVID-19 in the long term. This paper also finds that the Vietnamese government has effectively controlled the pandemic by leveraging and harnessing public trust and upholding traditional cultural values. The lessons drawn from policy responses and the Vaccine Fund in Vietnam, as a lower-middle-income country, serve as a useful COVID-19 reference for other developing countries.

Keywords: governmental policies, vaccination, vaccine diplomacy, vaccine fund, Vietnam.

Classification numbers: 4.1, 5.1

1. Introduction

The year 2019 witnessed the emergence of coronavirus from Wuhan, China, which was quickly declared a pandemic within months. As of 22 April

2022, there were 505.8 million confirmed COVID-19 cases worldwide, including 6.2 million deaths [1], with no sign that the devastating effects are abating. In addition to the tragic losses of human lives, the

*Corresponding author: Email: qvkhuc@vnu.edu.vn

pandemic has posed an unprecedented challenge to public health, food systems, and the global economy. During the last two years, the COVID-19 disease not only has not weakened over time, but genetic mutations have created new variants such as B.1.1.7 (in the UK), B.1.617.2 (in India), and Omicron (in Botswana), which spread at a faster speed and therefore pose a greater danger [2, 3].

Vaccines are widely recognized by health authorities and the medical community as a major tool for safeguarding public health [4]. Vaccines provide protection for individuals against COVID-19. Mass vaccination campaigns should therefore be implemented to create favourable conditions for the full resumption of economic and social activities. In the fight against infectious diseases such as smallpox, polio, rabies, typhoid, and the plague, vaccines have played a paramount role in reducing mortality [5]. According to the U.S. Centers for Disease Control and Prevention (CDC), vaccination is a key public health tool that has successfully elevated the overall level of wellbeing for humanity in the 20th century [6]. This is why a number of countries quickly and generously allocated financial and human resources to COVID-19 vaccine research shortly after the onset of the disease outbreak.

Besides a number of common preventive measures such as face masking, social distancing, quarantine, travel restrictions, and lockdowns, there is high expectation that vaccines will bring an end to the COVID-19 pandemic. As of 6 June 2021, approximately 2.15 billion vaccine doses have been administered globally [7]. The U.S. accounted for the highest proportion at nearly 14% (more than 300 million doses) [7]. According to the CDC on 2 April 2021, those Americans who have received the second vaccine shot could move around freely and resume their social activities. It is clear that with the fastest vaccination speed, the U.S. has been able to re-open borders, restaurants, hotels, and place the economy on a path to recovery (with 6.5% growth rate in the first quarter of 2021) [8]. In the first months of 2022, several countries have switched from a “zero-COVID-19” strategy to “living with COVID-19” strategy in which people are allowed to resume all activities with lockdowns abandoned or eased.

Vaccinating the global population for COVID-19 has been the biggest public health campaign in the history of the world. The production, affordability, allocation, and deployment of vaccines are massive

challenges for the whole world, particularly for low- and middle-income countries [9]. In fact, some wealthier countries such as the United Kingdom, France, the U.S., and China have been administering boosters or third vaccine doses to their citizens. In contrast, the percentage of people who received at least one dose is only 15.2% in low-income countries [10]. It is clear from Fig. 1 that the percentage of fully vaccinated people in most African and Southeast Asian countries only account for 10-20% and 50-70%, respectively [7].

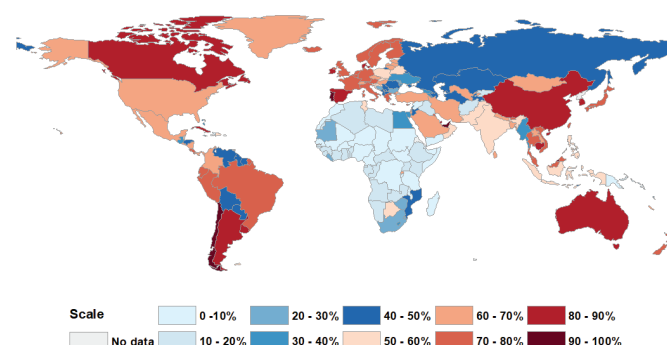


Fig. 1. Share of people who received at least one dose of COVID-19 vaccine. Source: Our World in Data [11].

To achieve global control of COVID-19, there are several vaccination-related challenges that must be overcome, namely: vaccines must be mass-produced, reasonably priced, distributed globally so that they are available where they are needed, and widely deployed in local communities (Fig. 1) [9]. An affordable price reflects elements of public investment and risk-sharing taking into account large purchase volumes and sustainable funding for COVID-19 vaccines and vaccination programmes. Setting vaccine prices is especially important as it affects a country's ability to procure sufficient supply. This is because countries are aiming to vaccinate their entire population as quickly as possible, which makes the total cost of acquiring vaccines potentially unaffordable for many governments, even when the price per dose is relatively low [9]. According to O.J. Wouters, et al. (2021) [9], governments will need to raise substantial financing through either domestic national budget or external aid to adequately fund COVID-19 vaccination programmes, which includes the costs of distribution, administration, record-keeping, and monitoring. For example, the World Bank and other multilateral development banks have earmarked billions of dollars in funds for COVID-19 vaccination programmes for low- and middle-income countries.

With 98 million people, Vietnam ranks 15th globally in population size [12]. As of 6 June 2021, however, only 1.24 million citizens received at least one COVID-19 vaccine dose, which makes up 1.11% of the total population [7]. However, as illustrated in Fig. 1, as of 31 March 2022, this figure surged to 79.2%; modest compared to that of the rest of the world, yet relatively larger than that of other Southeast Asian countries such as Malaysia (78.7%), Laos (60.6%), Indonesia (57.23%), and Thailand (71.8%) [11]. In the fourth outbreak, Vietnam recorded 5757 cases within the first 40 days (between 27 April and 7 June), which is twice as large as the total of the three previous outbreaks [13]. This dealt a powerful blow to the national economy, health care systems, non-smoke industry, and the education sector. Take Bac Giang province as an example. The gross regional domestic product of this province in Vietnam was the highest in 2020 with provincial exports valued at 10.9 billion USD (an increase of 44.8% from 2019) [14], however, during the latest outbreak, the province was locked down and many industrial zones closed [13].

Acknowledging the important role played by vaccines in suppressing COVID-19, the Vietnamese government invested heavily in domestic vaccine development. On 30 January 2021, the Oxford-AstraZeneca vaccine was approved, and its vaccination commenced on 8 March in Vietnam. The Sputnik V was later approved for use on 23 March, while the Sinopharm vaccine was approved for emergency use on 4 June. As of 7 June 2021, Vietnam ordered a total of 68.9 million doses of Oxford-AstraZeneca and 20 million doses of Sputnik V [13]. Meanwhile, four Vietnamese pharmaceutical manufacturers have engaged in the research and development of COVID-19 vaccines: VABIOTECH, POLYVAC, IVAC, and NANOGEN. Among them, the Nano Covax vaccine developed by Nanogen was the first vaccine in Vietnam to complete the research process and achieve high efficacy in pre-clinical trials. Currently, the third vaccine injection is ready to be trialled by volunteers. Additionally, Covivac, which is developed by VABIOTECH, started human clinical trials on 3 March 2021 and is considered to be the second potential vaccine as part of the domestic COVID-19 response toolkit. Vietnam is also actively promoting the purchase of vaccine technology with the aim that these technology transfers would bolster domestic vaccine production capability to service the local population [13].

Since the first domestic case was recorded, the Vietnamese government has taken prompt actions and shown flexibility in policy implementation. For instance, from January to July 2020 (with a total of 413 confirmed cases and 99 days of no new infection from local communities), there were close to 1000 policy documents issued in different classifications. The policy system responded promptly, proactively, and effectively at multiple authority levels (33 different agencies from the national to provincial governments) using a range of policy tools and measures [15]. At that time, it is estimated that Vietnam needed at least 150 million vaccine doses to achieve herd immunity with an associated cost of approximately 25 billion VND (12 million USD). Showing awareness of this enormous financial undertaking, on 26 May 2021, the Vietnamese government established the COVID-19 Vaccine Fund. This is a deft policy move on the part of the government to secure private sector financing to help with vaccination costs and to achieve herd immunity as quickly as possible [16].

This paper aims to review the pandemic policies of the Vietnamese government, particularly the establishment of the Vaccine Fund, in order to draw valuable lessons on combating the COVID-19 pandemic not only for Vietnam but also for other low- and middle-income nations around the world. We employ the critical review method to analyse secondary data on policy responses, financial policies, and the Vaccine Fund collected from various vetted sources in Vietnam and the scholarly literature.

The remaining sections are laid out as follows. Section 2 provides background information on the four COVID-19 outbreaks in Vietnam. Sections 3 and 4 present the literature review, data collection, and processing procedures. The findings on policy responses, financial support, and the Vaccine Fund are reported in section 5. Section 6 discusses the key findings and/or policy implications. Finally, section 7 summarizes the key findings and/or policy implications.

2. Background

COVID-19 has exerted far-reaching global ramifications on daily activities, social well-being, and sustainable economic growth. It has spread with ruthless rapidity to 220 countries and claimed millions of lives. Vietnam has so far experienced four outbreak waves (Fig. 2). Throughout these four episodes, the government has applied various preventive

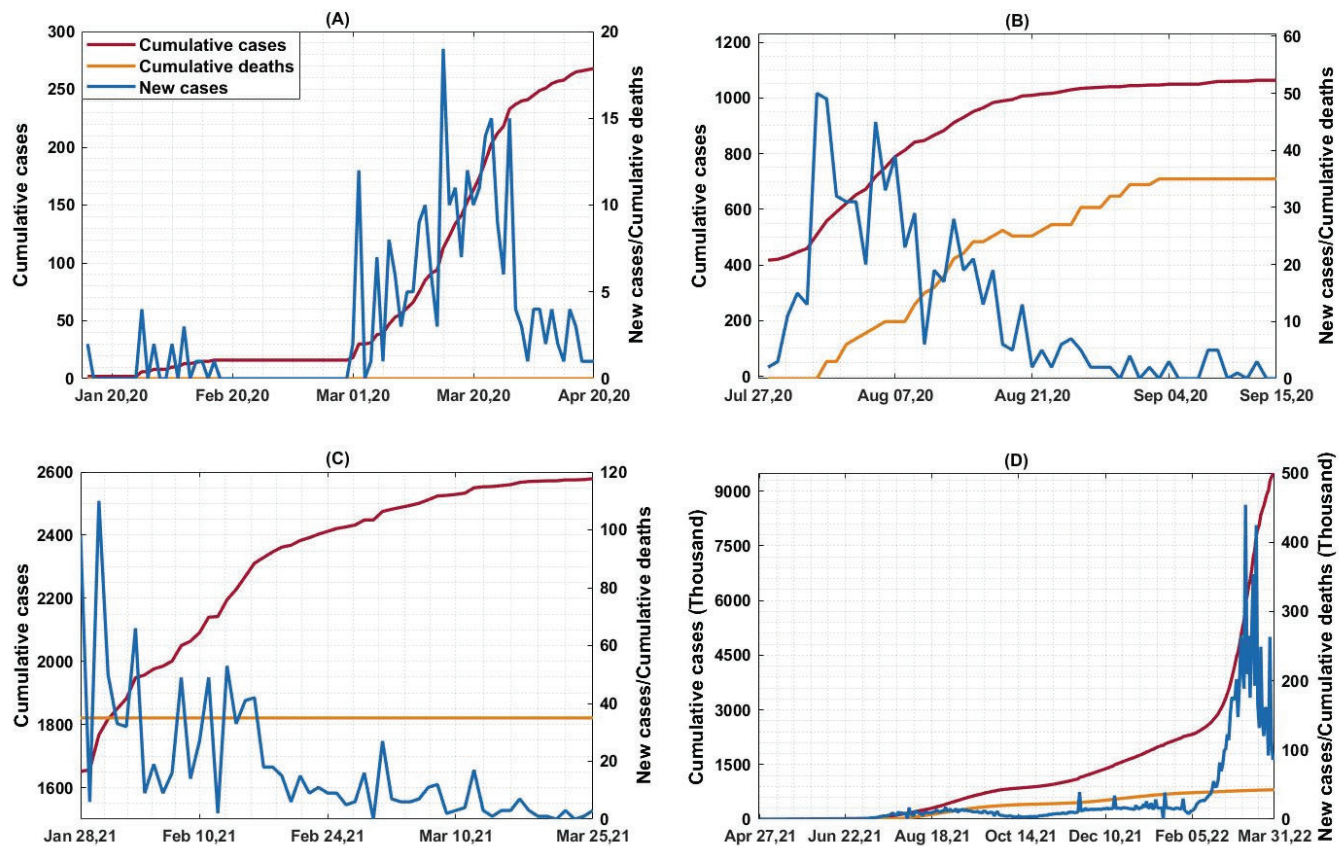


Fig. 2. The progression of COVID-19 across the four waves in Vietnam. Source: Compiled by authors.

measures including personal hygiene, nationwide social distancing, and travel restrictions depending on the severity of the outbreak, demonstrating the government's flexibility in implementing policies of disease control and prevention.

2.1. First wave

The first two confirmed cases in Vietnam were admitted to Cho Ray hospital in Ho Chi Minh city on 22 January 2020. The Chinese man flew from Wuhan to Hanoi to visit his son, who was reported to have contracted the virus from his father when they met in Nha Trang on 17 January [17]. On 1 February, a 25-year-old female (#6) was diagnosed with coronavirus in Khanh Hoa province, which marked the first case of domestic transmission [18]. Then Vietnam declared the acute respiratory disease caused by the new coronavirus (nCoV) a pandemic in Vietnam and introduced laws to tighten border control, revoke air permits, and restrict visa issuance [19]. Early detection of confirmed cases and prompt active contact tracing are two key factors for Vietnam's initial COVID-19 success story. For the first 16 cases, the medical staff treated a variety of

patients including infants, the elderly, and those with underlying conditions. This initial phase was akin to "an exercise" for the Vietnamese medical system to prepare and study the new virus.

With a 22-day streak of no community infection, the first COVID-19 outbreak was kept under control. However, on the evening of 6 March, the Hanoi Department of Health confirmed the 17th case in the capital, which was a 26-year-old woman who returned to Hanoi from Europe [20]. Subsequently, the government tracked and isolated about 200 close contacts of those infected within a day to avert community transmission. In March and April 2020, the number of cases increased rapidly due to a large number of people coming from European countries and emerging epicentres such as Bach Mai hospital in Hanoi and Buddha bar in Ho Chi Minh city, urging the government to implement nationwide social distancing [21]. As of 30 April 2020, the first outbreak of COVID-19 in Vietnam culminated in a total of 270 cases. The number of people who recovered from the disease was 224. The drastic pandemic control measures yielded positive results and the country

confirmed no more local transmission cases from mid-April to the end of July. As a result, Vietnam began loosening domestic travel restrictions in May 2020 [22].

2.2. Second wave

By 25 July 2020, Vietnam marked 99 days without any community transmission before a new outbreak emerged in the city of Da Nang [23]. It was especially crowded in July as people were eager to travel after a quiet Tet holiday because of social distancing and fear of COVID-19 infection. The government also promoted domestic tourism to offset economic losses from international tourists unable to visit Vietnam. What started as nosocomial transmission quickly spilled into the community and new incident cases increased by about 30 percent during the last week of July, which was reported to be the fastest growth rate since the beginning of the pandemic [24]. On 28 July, the Da Nang authorities immediately locked down the city for 15 days [25]. Between 25 July and 8 September, 551 locally transmitted cases were reported in 15 cities and provinces across the country. Approximately 98 percent of those cases were either connected to major hospitals in Da Nang or have visited Da Nang. Ironically, the first two deaths were recorded on 31 July after Vietnam has gained international plaudits as one of the most successful countries in its COVID-19 responses. A temporary hospital for treating suspected and mild cases was built and two other hospitals designated for COVID-19 treatment were placed under the direction of a special committee from the Ministry of Health (MOH) [26].

After two months of employing the same coping strategies as implemented in the first outbreak - targeted lockdowns, travel bans, business closures, mass quarantines, and widespread testing - Vietnam successfully contained the disease for the second time. As of 10 September, 61,968 people were being monitored, 998 were quarantined in health care facilities, 15,619 were quarantined in centralized facilities, and 45,351 self-quarantined at home [27]. Having kept the viral spread under control, Vietnam lifted restrictions and resumed almost all economic activities, including international commercial flights. However, sporadic community infections continued during November and December causing public panic and the authorities reacted with stronger measures.

2.3. Third wave

After 4 months of relaxed social distancing measures, Vietnam entered into the third COVID-19 outbreak where 84 community transmission cases were recorded within a single day on 28 January 2021 in Hai Duong and Quang Ninh provinces. Most of these were related to a Hai Duong migrant worker diagnosed with the UK variant and reported back to Vietnam as a new infected case by the Japanese authorities after arriving in Osaka on 17 January. Initially, the government only quarantined areas directly related to known infected cases for the purpose of disease control and minimum disruption to the economy. But after two weeks, there was still no sign of the case number slowing down. So, on 15 February, Hai Duong was placed in provincial lockdown for 15 days while Hanoi and Ho Chi Minh city suspended all entertainment activities [28]. Similar to the second wave, 3 field hospitals were swiftly built in Hai Duong to ease the burden on existing hospitals to provide treatment in response to the surge in COVID-19 patients [28]. This was the most serious outbreak since the beginning of the pandemic in Vietnam due to slow contact tracing process, mismanagement in quarantine facilities and residents' overly incautious attitudes and complete disregard for public health rules such as social distancing and lockdown after a long period of living with restrictions. Besides, there was an increase in infection risk and the danger level in the presence of a newly emerging variant with a much faster transmission rate [29]. During this wave, COVID-19 quickly spread to 11 more provinces and cities across the country. As of 16 February 2020, Hai Duong province recorded 501 cases, mainly in hot spots including Chi Linh, Cam Giang, Kinh Mon, and Nam Sach [28]. However, disease-stricken localities were not required to reduce trading activities. Authorities chose not to impose overly strict restrictions that would further inconvenience nearby residents and ensure that regular commercial trading could continue as usual in non-lockdown regions. On 7 March 2021, the situation in northern provinces appeared to have been largely brought under control when the number of new cases fell to single digits. On the following day, a mass COVID-19 vaccination campaign with the AstraZeneca vaccine for healthcare workers in Hai Duong, Hanoi and Ho Chi Minh city was launched [30].

2.4. Fourth wave (April 27, 2021 - present)

On April 27, 2021, after a series of nearly 50 days with no cases of COVID-19 in the area, Ho Chi Minh city recorded a new case of a man born in 1993 who flew into the city from the Ha Nam outbreak. This is considered the beginning of the fourth wave of the epidemic. The fourth wave of COVID-19, however, did not arrive until May 26, when the first case of the missionary group transmission chain located in Go Vap district appeared [31]. The Delta variant emergence and replication has compounded the pandemic scenario in Vietnam. With the rapid spread of the Delta virus in India, this chain of infections grew very quickly, with roughly 500 cases of COVID-19 in less than a week. In addition, this infection chain also gave rise to 21 other infection chains throughout 22 districts of Ho Chi Minh city. The fourth wave can be divided into two phases. In the first phase, the government investigated and isolated locations where cases were reported. For the first time during Vietnam's 1.5-year anti-pandemic, ten medical facilities were forced to blockade/medically isolate themselves to complete zoning and tracking in less than ten days. Three medical establishments in Hanoi have temporarily stopped receiving patients. After recording the first 14 cases of COVID-19 infection on the afternoon of May 5, the Central hospital for tropical diseases 2 (Dong Anh, Hanoi) decided on medical isolation [32].

Phase 2 is characterised by the number of infections per day exceeds 10,000 cases and the government's efforts to promote vaccination and vaccine diplomacy. On June 12, Vietnam reached more than 10,000 cases of COVID-19. After a month and a half, the number of cases increased to more than 100,000 cases. Nearly 2 months later, it reached more than 700,000 cases. The Prime Minister agreed to apply social distancing measures in a series of 19 southern provinces and cities from July 19. This is the first time that social distancing was implemented urgently throughout Ho Chi Minh city and several other locations. The health system was overburdened by too many F0 cases. In response to an escalating number of serious cases and deaths, a medical force of about 20,000 people was sent to Ho Chi Minh city and the southern regions to assist. In the northern regions, especially Hanoi - the capital of Vietnam, Omicron variant was the most dominant. The medical situation was less severe compared to that in the southern regions, yet the number of cases surged due to the variant's highly contagious nature. On March 8, 2022, a peak of 32,600 new cases was recorded, which then dropped to approximately 9,000

cases per day towards the end of the month. So far, 42,493 people have died from the COVID-19 outbreak as of March 31, 2022, accounting for 0.4% of total confirmed cases in Vietnam [33]. The cumulative number of confirmed deaths ranked 24th out of 227 countries and territories worldwide on 31st March 2022 [33].

Besides medical issues, the COVID-19 pandemic also took its toll on Vietnam's economy. Gross domestic product (GDP) in the fourth quarter of 2021 was estimated to increase by 5.22% over the same period last year, which was lower than the growth rate of the fourth quarter over the same previous of years in 2011-2019 before the pandemic. This was partly due to the negative growth of some service industries such as the transportation and warehousing industry and the accommodation and foodservice industry [34]. Moreover, the impact of the COVID-19 epidemic has left millions of workers in a crisis. According to the General Statistics Office, in the third quarter of 2021 alone, more than 28.2 million people aged 15 and over were adversely affected by the COVID-19 pandemic, increasing by 15.4 million people compared to the previous quarter [35].

In response to such a situation, the Government of Vietnam (GOV) has taken a number of measures. With aims to control the pandemic, focus was placed on accelerating the vaccination process. The largest-scale vaccination campaign in Vietnamese history was launched in July 2021 with the goal of 150 million doses for more than 75 million people by early 2022 [36]. Thanks to the COVID-19 vaccine fund and effective vaccine diplomacy with other nations, the goal was achieved. As of late January 2022, around 163.5 million vaccine doses were administered with up to 71.5 million people receiving the second jab, reaching 93% of the population [37]. More impressively, one year from the very first administered dose of the COVID-19 vaccine in Vietnam on March 8, 2021, the country has administered 198 million vaccinations and ranked as the sixth most highly vaccinated country in the world [38]. In addition, the state adopted a new anti-pandemic campaign, shifting from "zero COVID" to "new normal" in order to fight the pandemic while also recovering the economy. For example, inbound and outbound tourism was reopened starting March 15 under "new normal" conditions, showing positive signs for the service industries [39]. In Hanoi, food and beverage facilities remained open until midnight instead of being forced to close before 9 p.m. as previously required [40].

3. Literature review

Eradicating the 2019 coronavirus disease (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been the most formidable challenge faced by humanity over the last century. In their research examining infected patients, M.C. Paules, et al. (2020) [41] found that 20 to 30% required mechanical ventilation and 10% died, with higher fatality rates in older patients and those with medical comorbidities. According to a research study of 5,484 contacts of SARS-CoV-2 index cases detected in Lombardy, Italy, P. Poletti, et al. (2020) [42] reported that the risk of symptoms increased with age. Specifically, 6.6% of infected subjects older than 60 years had critical diseases, with males possessing significantly higher risk. A.S. Fauci, et al. (2020) [43] calculated the median age to be 59 years, with higher morbidity and mortality among the elderly and those with coexisting conditions (similar to the situation with influenza), where 56% of the patients were male. Notably, L. Zou, et al. (2020) [44] found that it is possible for person-to-person transmission to occur from asymptomatic COVID-19 carriers to the community. J.B. Aguilar, et al. (2020) [45] stated that the asymptomatic sub-population frequently escapes detection by public health surveillance systems, which results in contagion. On the other hand, the emerging genetic variants are now raising serious concerns about transmission of the coronavirus. B. Korber, et al. (2020) [46] reported on the spread of a SARS-CoV-2 spike (S) protein mutation, D614G (i.e., an aspartic acid to glycine amino acid substitution at position 614 in the viral S gene) across multiple countries, which suggested that it was a more 'transmissible' form of the virus.

As of 2020, there were 58 vaccines developed for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and in the process of clinical trials. M.D. Knoll, et al. (2021) [47] reported some vaccines had more than 90% efficacy against COVID-19 in clinical trials such as Moderna or Pfizer/BioNTech. A group of researchers showed that the recent COVID-19 vaccines have an efficacy rate of disease prevention between 50% and 94% against the D614G and B.1.1.7 genetic variants [48]. Therefore, an increase in vaccine uptake in the community should strongly boost the chance of achieving herd immunity. In particular, T.P. Velavan, et al. (2020) [49] showed that vaccination played an indispensable role in herd immunity and should be applied to each age group. A game was also created by W. Lim, et al. (2020) [50] to prove that vaccination played a key role in facilitating the elimination of a pandemic.

On the other hand, successful herd immunity requires high willingness in the community to get vaccinated. H. Harapan, et al. (2020) [51] studied the acceptability of COVID-19 vaccine in Indonesia, which was found to be highly influenced by the baseline effectiveness of vaccines. The authors showed that 93.3% of respondents would like to be vaccinated by a 95%-effective vaccine, but the acceptance rate decreased to 67.0% (911/1,359) when vaccine effectiveness dropped to 50%. S. Neumann-Böhme, et al. (2020) [52] conducted a survey investigating the difference in willingness across European countries in receiving COVID-19 vaccine and found that if availability was not an issue, 73.9% of respondents from Denmark, France, Germany, Italy, Portugal, the Netherlands, and the UK were happy to get vaccinated. The difference in the level of willingness between countries ranges from 62% in France to 80% in Denmark [52], which can be mainly attributed to the German and French respondents expressing deep concerns about the vaccine side effects. L.P. Wong, et al. (2020) [53], using a belief model for Malaysia, found a definite intent to receive the vaccine at 48.2%, followed by a probable intent at 29.8%, and a possible intent at 16.3%. Within the Malaysian cohort, 28.9% were willing to pay MYR\$100 (US\$23) and 27.2% were willing to pay MYR\$50 (US\$11.5) for vaccine. Y. Lin, et al. (2020) [54] investigated vaccination willingness in China and showed that a high "probably yes intent" at 54.6% while a "definite yes intent" was only at 28.7%. Moreover, the Chinese respondents, whose responses were expected to be mainly influenced by socio-economic factors, tended to express a preference for domestically produced vaccines and their willingness to pay was CNY¥200 (US\$28). On the contrary, a study conducted in the Middle East by W.A. Al-Qerem, et al. (2021) [55] concluded that a comparatively high percentage of participants (36.8%) would decline vaccination if it becomes available and 26.4% answered "Not sure" [55]. The main reasons for their vaccine refusal or hesitancy were concerns about vaccine efficacy and the need for additional information. Results from a Chilean study conducted by A.A. Cerda, et al. (2019) [56] showed that the top reason for vaccine hesitancy was the risk of side effects (40% of respondents), which is followed by a lack of knowledge about the vaccines (24%).

Newly emerging COVID-19 variants have been becoming more transmissible and causing higher fatality rates. At the same time, vaccine supply has been in chronic shortage worldwide. Hence it is imperative for governments to take leadership in devising policy

frameworks to optimize provision and distribution in order to improve vaccine equality. According to the WHO, well-managed vaccine programme and logistics support can increase efficiency and quality while minimizing operational costs [57]. A U.S. study showed that only 59.1% of respondents reported a high level of trust in COVID-19 vaccine, which suggests that government agencies need to disseminate information more promptly through platforms with high volumes of users to maximize reach [58]. J.V. Lazarus, et al. (2021) [59] conducted a global survey of 13,426 people and found that it is more likely for respondents to agree to get vaccinated if they trust the information published by government sources. Moreover, rural residents usually account for a greater proportion of the national population in developing countries. As there is scant research examining their vaccination willingness, it is important for governments to initiate more in-depth studies to offer scientific guidance on achieving herd immunity in rural communities.

Since the rollout of COVID-19 vaccines, uneven vaccine distribution persisted either between regions within a country or across countries internationally. Evidences of vaccine inequality were abound in that nearly half of all supply available in the world were concentrated in China and the United States, yet merely 2% are allocated for Africa [60]. High-income countries, despite constituting only 16% of the world population, hold 65% of all COVID-19 vaccines, whereas the figures for middle- and low-income countries are 26% and 9%, respectively [61]. According to the MOH, Vietnam was estimated to require 150 million doses to ensure adequate COVID-19 vaccination in 2021, which is believed to be vital in preventing the spread of COVID-19, thereby raising the need for massive financial injection from the government [62]. At its regular meeting in May 2021, the government agreed to cut at least 50% of expenses for the remainder of the year on conferences and business trips taken by ministries, central agencies, and local authorities. There was also an additional 10% savings to come from reductions in recurrent expenditures in 2021 to supplement COVID-19 prevention and control, investment project promotion, and necessary security and defence tasks [63]. According to preliminary calculations by the MOH, the cost of buying and administering vaccines was about 25,000 billion VND (\$1.1 billion) [62]. Moreover, it was expected that fiscal pressures on the state budget would continue to intensify the longer the pandemic persists in addition to the potential demand for annual booster shots in the future.

According to IMF (2020), more than 40 countries approved extra budgetary expenditures to raise the level of financial support in response to the COVID-19 crisis [64]. As the pandemic had placed tremendous pressure on the Vietnamese government to balance the national budget, it was critical that an alternative channel of financing was established to fund vaccine activities. According to the Prime Minister, a COVID-19 Vaccine Fund was founded with the view that social contributions from the private sector would help ease pressures on the state budget for vaccine import purchases and R&D for domestic vaccines [65]. Bui Dinh Hien, a lawyer from the Hanoi Bar Association, maintained that “A separate COVID-19 vaccine charity fund should be established to gather all sources of support in an open and transparent manner for jointly public supervision and be subject to inspection, examination and supervision according to the law regulations” [66]. Clifford Chance (2020) [67] reviewed the pandemic financial assistance practice of 21 countries including measures of liquidity injection into the credit markets for businesses, sick pay or unemployment benefits for workers unable to work, tax cuts, and improved credit schemes. In an OECD (2020) [68] study, more than 160 countries implemented expansionary monetary and fiscal policies including quantitative easing carried out by the European Central Bank and the U.S. Federal Reserve. Moreover, there were many other government programmes in the forms of guarantees, loans, deductions, recapitalizations, and grants provided by banks. In most cases, the government initiates financial measures to aid businesses, but not many countries utilize a Vaccine Fund to call for donations from the private sector as a way of speeding up the vaccination process.

4. Methods

We obtained data on pandemic policy responses, financial policies, and the Vaccine Fund to conduct our study along these three dimensions. Data on policy responses would provide an overall picture on how and the extent to which the government has been able to control COVID-19. Information extracted from financial policies would focus on how the government supports businesses and citizens during the pandemic period. Finally, we examine the Vaccine Fund, which is perceived to be the most effective way for the Vietnamese government to mobilize financial resources in the private sector

to help achieve herd immunity by the end of 2021. Additionally, the Fund is expected to also aid in the longer-term phases of the COVID-19 campaign financially [68]. Because the primary goal of this paper is to examine government policies in response to the COVID-19 pandemic, we employed secondary data only [69]. We utilized four data sources (Fig. 3). Government policy documents are our first source (Fig. 3A), which were obtained from the government web portal (<http://vanban.chinhphu.vn/>). This source focuses on COVID-19 information disseminated in Vietnam. We used the MOH's official COVID-19 information page (<https://ncov.moh.gov.vn>) to collect data on new and accumulated cases, recoveries, and daily deaths since the first outbreak. This second source contains COVID-19-related scientific documents (Fig. 3B). We extracted these documents using some of the most popular websites including Web of Science (WOS), Scopus, Google Scholar, and ResearchGate to summarize the existing literature review on vaccination and governments' responses to epidemics and pandemics. The search phrases and key terms were constructed based on the study purpose, namely, "COVID-19", "vaccination", "governmental policies", "vaccine fund", and "vaccine diplomacy." The third source comes from electronic and online newspapers (Fig. 3C). We mainly obtained information from Vnexpress and Vnexpress International (<https://vnexpress.net>) because they are the most popular bilingual online newspapers in Vietnam and they keep readers abreast of the latest Vaccine Fund developments on a daily basis. The last source is the vaccine fund's website (<https://quyvacxincovid19.gov.vn/>) (Fig. 3D). We obtained all information about the fund's establishment, progress in receiving donations, and daily funding updates.

When performing data validation, we carefully checked the accuracy and/or relevance of the collected data [70]. Specifically, we focused on three key information categories: COVID-19 progress, policy, and the Vaccine Fund. A 2-3-person team is responsible for compiling the dataset for an information category. One person would conduct the search;

once data is obtained, the other person checks to confirm the validity of the collected data; and finally the two team members and the group leader collaborate to verify and decide whether to proceed with the constructed dataset. As the pandemic began in late 2019, we relied heavily on documents published only in the last two years.

The data is cleaned, coded and verified [69]. Data cleaning includes removing noisy/false/unnecessary information and rectifying missing data. Data coding aims to shorten information attached to data and making it easier to incorporate into statistical methods. Lastly, data verification confirms that the data is accurate and ready for further processing. We classified the provincial and governmental documents that we collected into 8 policy categories [12]: (1) Outbreak announcements and steering documents; (2) School closures; (3) Emergency responses; (4) Border control measures; (5) Social distancing and isolation measures; (6) Financial supports; (7) Medical measures; (8) Other policies related to COVID-19. We use descriptive statistics and critical overview analysis to analyse the data and draw relevant lessons and/or policy implications for Vietnam and other similar countries. Data visualization, which helps to communicate our story more concisely, is carried out using Python version 3.7.7 and ArcGIS version 10.2.2.

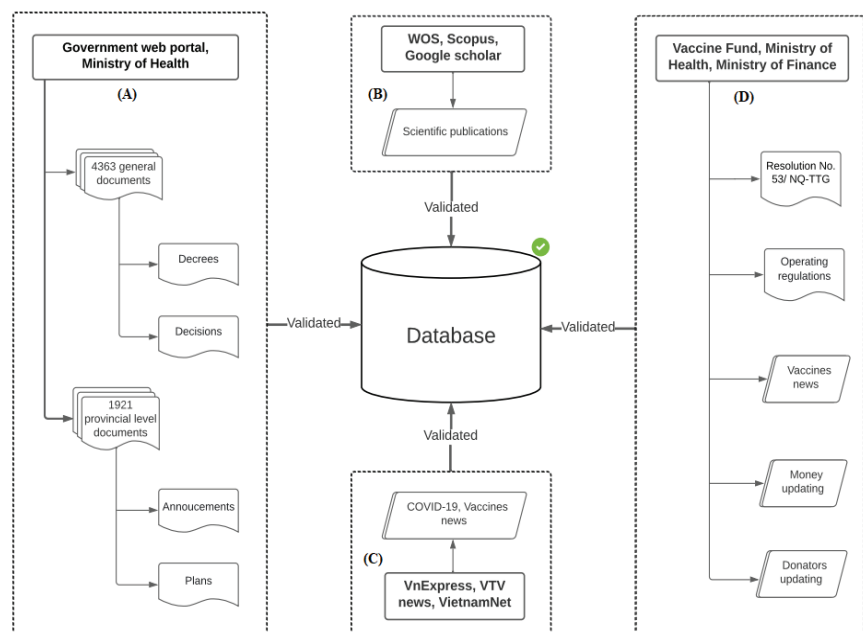


Fig. 3. Data collection flowchart. Source: Authors.

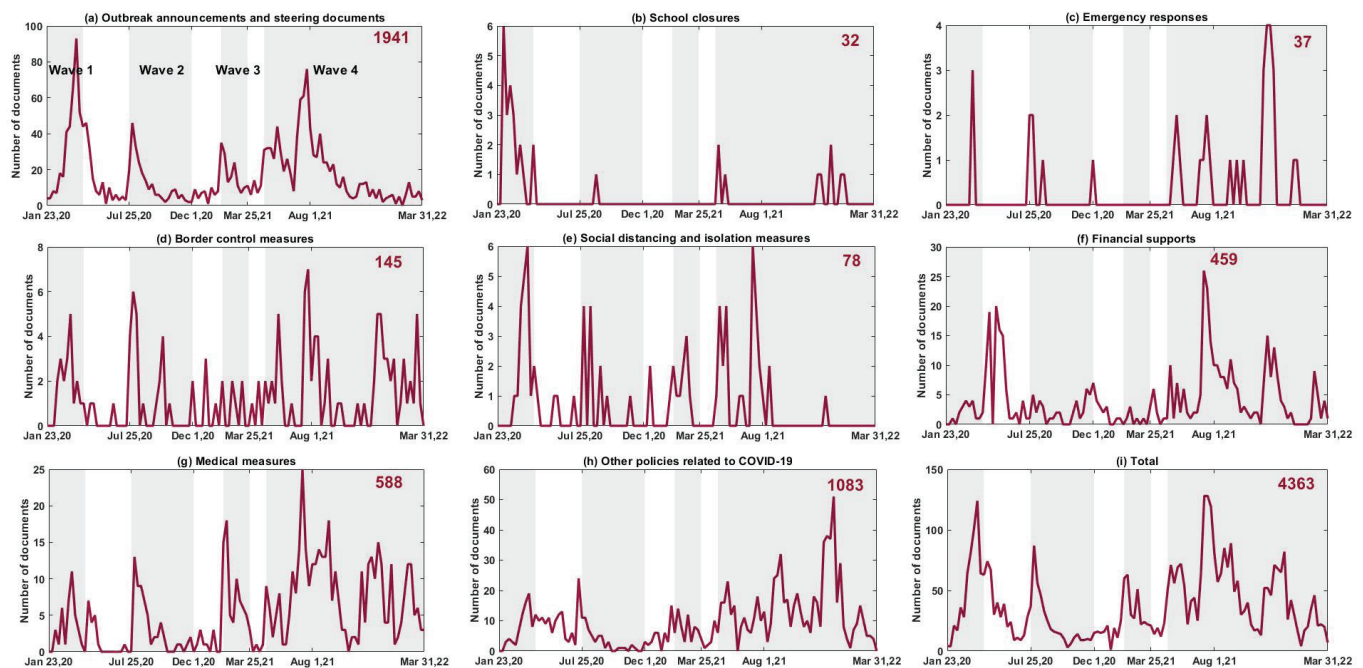


Fig. 4. Legal documents by topics over the four different COVID-19 outbreaks. Source: Compiled by authors.

5. Results

5.1. Pandemic policy responses

The line graphs illustrate the weekly number of policy documents from the 8 categories over the four COVID-19 outbreaks in Vietnam (Fig. 4). We take the frequency of official policy document publication as a measure of the intensity level of pandemic policy responses by the government. Over the four COVID-19 waves, outbreak announcements and steering documents/medical measures are the two most frequently used policies, while school closures and emergency responses register the lowest numbers of policy document publication.

During the study period, the total publication number of policy documents fluctuated greatly. The number of newly enacted policies reached its local peak either at the beginning of an outbreak (Waves 2-4) or during the outbreak (Wave 1) before subsiding. The total number of policies decreased substantially in the transition intervals. Outbreak announcements and steering documents accounted for approximately half of all policy documents (1941), over three times as many as the second most used policy in medical measures (588). The fourth outbreak has the highest total number of published policy documents due to its long duration and high severity.

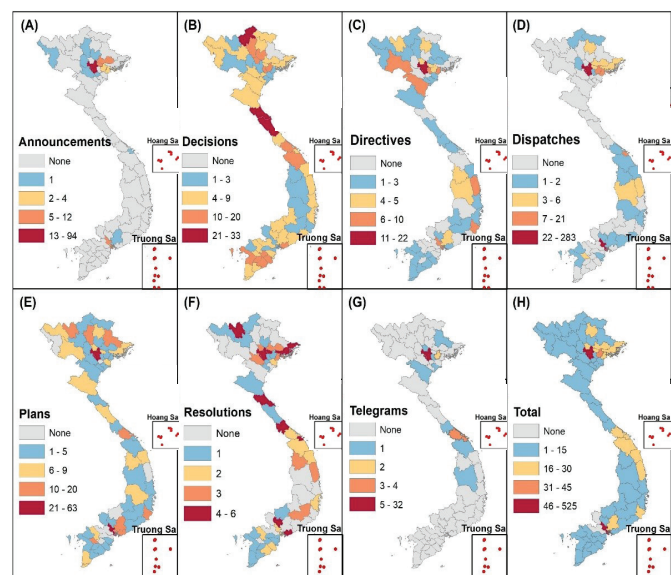


Fig. 5. Policy documents by topic and province during the COVID-19 time. Source: Compiled by authors.

In terms of the geographical distribution of COVID-19 policies in Vietnam, there were generally substantial differences in publication numbers between the northern, southern, and central regions. Fig. 5 shows that more policies were published in the north than in the south of the country. They also varied greatly among provinces as the majority of policies were introduced in the two largest cities Hanoi and Ho Chi Minh.

COVID-19 exerted widespread negative effects on Vietnam and no regional provinces were spared because of their economic interdependence and potential risks of cross-infections. As clearly illustrated in the maps, policies were applied nationwide but there is substantial unevenness in their spatial distribution between major cities such as Hanoi and Ho Chi Minh, and other provinces.

The GOV and the MOH issued the highest number of guidelines and announcements to the public with some documents classified as exclusive to limited communications. The two agencies that issued the bulk of communications were the Ministry of Finance and the GOV. The remainder includes the COVID-19 Prevention Committee and the Ministry of Transport and various other ministries of which documents issued constituted a small proportion. We can also connect different types of policy documents to each agency. The MOH was the primary agency that published dispatches, decisions, and plans. Furthermore, certain types of documents were almost exclusively published by some government agencies. The GOV was the dominant issuer of announcements while most circulars were published by the Ministry of Finance.

5.2. Financial support policies

The COVID-19 pandemic has imposed tremendous costs on the economy of Vietnam. To combat the economic downturn, the government launched large-scale fiscal and monetary support packages. However, there are concerns that if these macroeconomic packages are poorly designed and executed, they could pose a threat to the stability of domestic financial markets. Thus, legislators need to be scrutinized more closely to avoid hasty decisions. So far, various government agencies have issued hundreds of policy documents on financial support measures. We classify these measures into 4 groups and discuss them in more detail below.

Tax support policies: The government simultaneously improved the tax law and extends the tax break period for residents and businesses. For instance, enterprises, cooperatives, non-business units, and other organizations that generated total revenues less than 200 billion VND in 2020 were entitled to a 30% reduction in payable Corporate Income Tax (CIT) (Resolution No. 16/2020/QH14; Decree No. 114/2020/ND-CP) [71]. Accordingly, this tax break measure benefited about 700,000 enterprises (or 93% of the total number of enterprises

operating in the country). Moreover, extending the deadline for tax payment and land rent (Decree No. 41/2020/ND-CP), which became effective from the date of signing on 8 April 2020, created more favourable conditions for businesses and households to survive through the economic hardship caused by COVID-19 [72].

Credit support policies: Since the beginning of 2020, the State Bank (SBV) has loosened domestic monetary conditions on three separate occasions by cutting a suite of operating interest rates, namely, deposit interest rates, open market operations interest rates, lending rates, and rediscount rates [73]. Additionally, a credit support package, with an estimated value of 36.6 trillion VND (0.6% of GDP), was introduced to complement the interest rate reductions. Specific measures in the package include: (i) Preferential interest rates for new loans originated by credit institutions that are 1-2.5% lower than normal rates (and this committed reduction totals to 600 trillion VND); (ii) Credit institutions to restructure the repayment term while keeping the same debt group (no penalty interest); (iii) Interest exemption or reduction by 0.5-1.5% per annum for existing loans; (iv) Exemption and reduction of fees, especially payment fees and some other service fees [74].

Social security packages: These policies aim to support unemployed workers. A 62-trillion-VND support package was implemented during the first outbreak targeting 20 million people in 7 categories, i.e., those who have performed meritorious services to the Revolution that are covered by monthly preferential policies; those who are covered by social protection schemes; poor and near-poor households; furloughed employees who are on unpaid leave; and employees whose contracts were terminated [75]. The 18,600 billion VND support package that was introduced in the second outbreak focused on supporting small- and medium-sized enterprises, cooperative groups and workers affected by the COVID-19 pandemic [76].

Deepening the domestic capital markets: COVID-19 has made it more difficult for businesses to secure capital through credit institutions in Vietnam. Thus, the government introduced new measures to facilitate raising capital through bond issuance, creating an important mobilization channel for businesses. Specifically, Decree No. 81/2020/ND-CP, which was introduced on 9 July 2020, amended a number of articles of Decree No. 163/2018/ND-CP.

Its purpose was to append regulations and sanctions governing bond trading and enhance information disclosure for bond issuance by businesses [77].

Although the government has implemented many policies to support those affected by the COVID-19 pandemic, a joint study by National Economic University (NEU) and Japan International Cooperation Agency (JICA) showed that only 22.25% of businesses were able to access financial support packages in which fiscal measures such as tax breaks and social security were found to have highly positive impacts [78]. By contrast, businesses often reported that complicated procedures hindered access to government loans, and this is reported to have affected 54.6% of businesses in Vietnam. On the other hand, social security packages were inefficiently implemented as evidenced by the disbursement progress found to be at only 20% of the target mainly due to problems in the approval process for casual and non-officer employees.

In short, the timely implementation of financial policies has partly achieved positive results in supporting businesses and households so far and is able to restore some levels of economic and social activities. However, these are only temporary policy measures to stabilize economic fluctuations as the main threat to the economy remains epidemiological in nature. Hence, the long-term strategy to combat the pandemic is through medicine but this requires the population to work co-operatively with the government.

5.3. COVID-19 Vaccine Fund

It is increasingly clear, as COVID-19 drags on with rising infection numbers across the country, that vaccines are the only way to achieve herd immunity and possibly end the pandemic. At the same time, given the additional fiscal pressure on the national budget, the government will not be able to muster sufficient public funding to purchase and administer vaccines. Therefore, establishing the Vaccine Fund (Fig. 6) is necessary to mobilize private sector financial resources from individuals and organizations to help speed up vaccine purchase so that large-scale vaccination can be quickly deployed to the Vietnamese people. On 26 May 2021, Prime Minister Pham Minh Chinh signed Resolution No. 53/NQ-TTg to establish the COVID-19 Vaccine Fund. The MOH is given the primary responsibility of co-ordinating with the Ministry of Finance to purchase and import vaccines, research and produce vaccines

domestically, and implement the vaccination programme. According to the regulations, documents would need to be submitted to the Prime Minister for approval on spending from the Fund to finance the above activities. The Ministry of Finance then disburses funds as approved by the Prime Minister and in accordance with the base profile of the MOH proposals.

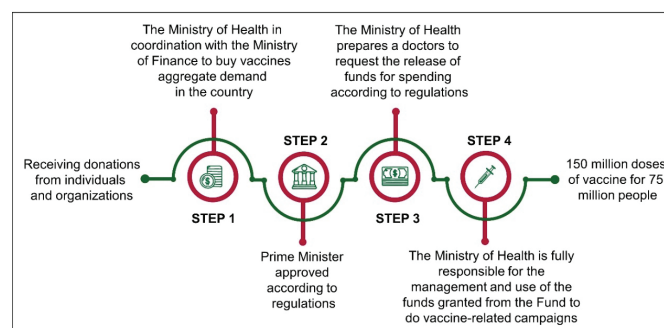


Fig. 6. Operation process of the Vaccine Fund. Source: Compiled by authors.

When herd immunity is assessed to have been achieved, the government would announce the termination of the Fund. Any unused balance held at the Fund will be transferred to the central budget at the time of its dissolution. The Vaccine Fund was launched on the evening of 5 June 2021 in the capital Hanoi by Prime Minister Pham Minh Chinh and leaders of the Central Committee of the Vietnam Fatherland Front. During the launching ceremony, Prime Minister Pham Minh Chinh emphasized that, “The consensus of the people is the key to open the great door for us to get out of the pandemic and return to a normal, peaceful and safe life”. As of 10 p.m. on the same evening, total contributions from businesses to the Vaccine Fund were close to 1,268.5 billion VND of which more than 17 billion VND were transferred via text messages. After launch day, the level of contributions continued to increase dramatically, especially on 7-8 June where it increased threefold. By 9 pm on 2 July, the total amount reached 8,038 billion VND of which nearly 106 billion VND were sent by 2.37 million text messages with an average of 74,000 text messages per day. As of 5 July, total contributions have reached 8,046 billion VND with a daily rate increase at approximately 225.9 billion VND. After nearly one year of establishment, over 2,562,314 VND via SMS, 113.79 billion via Portal 1400, and 4.23 billion via the COVID-19 Vaccine Fund website was donated by 419,872 individuals and organization (Fig. 7).

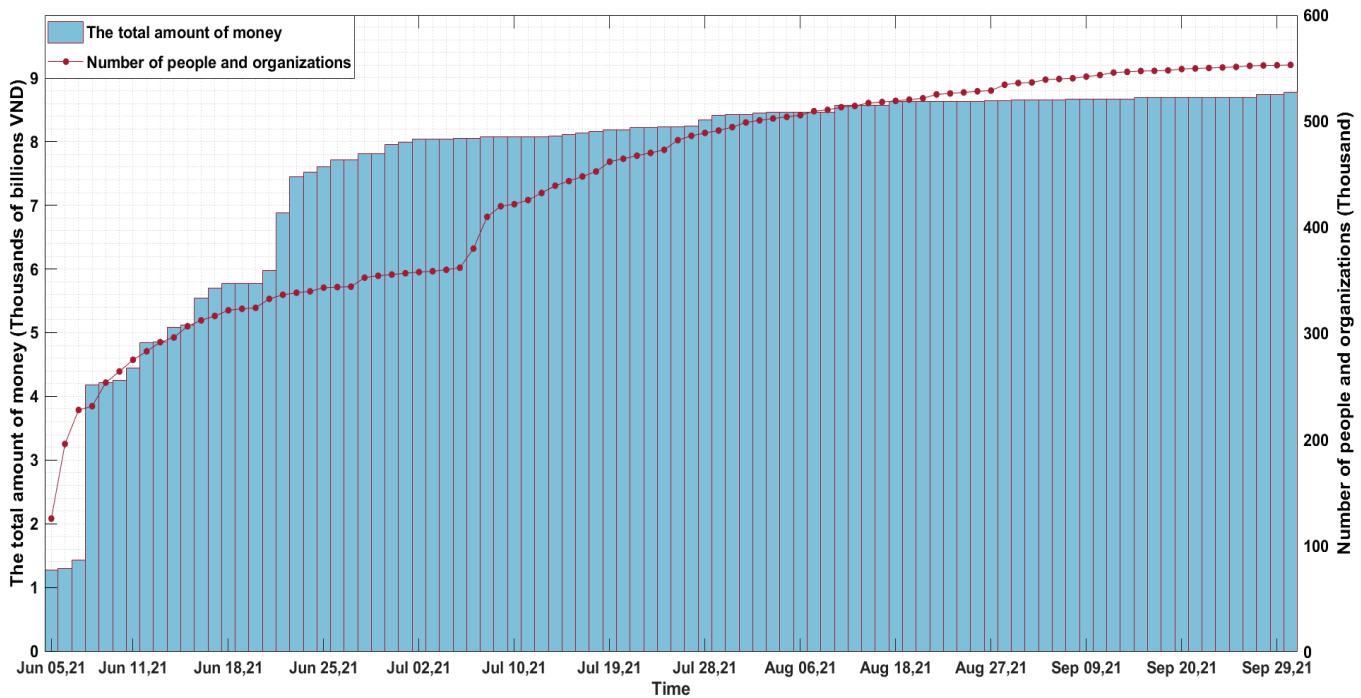


Fig. 7. The contribution progress of the Vietnam Vaccine Fund. Source: Compiled by authors.

5.4. COVID-19 vaccine diplomacy

In addition to full exploitation of internal resources, a call for aid from wealthy nations should be attached with great significance to secure a fluid and well-supplied flow of vaccines against COVID-19. Hence, vaccine diplomacy can be seen as a short-term solution to vaccine shortages in low- and middle-income countries. In essence, vaccine diplomacy is a form of medical diplomacy for cooperation on vaccine supply to strengthen public access to vaccines nationwide. High vaccination coverage enables wealthy countries to recover from the pandemic and even Russia and the U.S. have millions of doses expired, whereas developing countries are far behind in their inoculation efforts and attempting to cope with a severe lack of vaccines.

Acknowledgement of the importance of vaccine diplomacy at the peak of the COVID-19 outbreak, the Vietnamese government has actively promoted vaccine diplomacy. Specifically, Prime Minister Pham Minh Chinh signed a resolution on the formation of a Government Working Group on Vaccine Diplomacy on August 13, 2021 [79]. Working group is responsible for mobilizing aid for vaccines, therapeutic drugs, and medical products; transfer technology to produce vaccines and drugs from bilateral and multilateral

partners; report to the Prime Minister for direction on measures to be implemented. It is noted that vaccine diplomacy is not limited to strengthening access to vaccine sources in the form of either purchases or donations, yet it consolidates international cooperation in technology transfer, which opens a wide range of opportunities for sustainable vaccine supply.

In response to vaccine shortages and a surge in infected cases, Vietnam has launched an appeal for vaccine donations from foreign countries. As of October 24, 2021, a total of 101,786,606 doses of COVID-19 Vaccine have arrived in Vietnam [80]. In terms of bilateral negotiation, Vietnamese high authorities also successfully negotiated vaccine companies with a total of more than 180 million doses. Currently, 66,939,386 doses have been distributed, with another 114 million doses on the way. Aside from vaccine purchasing, more than 20.7 million doses of the vaccine through the COVAX mechanism and are being added. In addition, more than 13 million doses have already been sent directly from other countries, and more than 8.2 million doses are coming as planned [80].

6. Discussion

As of 20 June 2021, Vietnam has recorded a total of over 10.5 million local infections and 43,000 deaths [81]. These numbers are comparatively mild by global

standards, which makes the country one of the best performers around the world in resisting COVID-19. The main reason for this outcome can be attributed to the government's timely and comprehensive policy responses throughout the four outbreaks. The central government and ministries have issued nearly 2000 policy documents across the country. Geographically, more than 1000 are issued by provincial authorities (Fig. 5) containing directives to inform the public of the latest developments and establish measures to control the pandemic. More specifically, the widespread use of the 5K-formula, combined with strong contact tracing technology to localize and isolate cases in quarantine areas, has effectively limited and controlled the pandemic. Despite being hampered by poor resourcing constraints, Vietnam is still able to effectively combat the pandemic, which serves as an example to other countries facing similarly difficult circumstances [15, 82, 83].

Increasing the vaccination rate to achieve herd immunity remains the key to suppressing the pandemic completely in the long term. Despite being one of the few countries that had early success, Vietnam still has a low vaccination rate [7]. The problem is that this is likely to lead to spikes in transmission and infection rates. This was evident during the fourth wave that added another 865,559 infection cases, which makes this last surge far worse than those of the previous three waves. Given that dangerous strains from India and the United Kingdom are circulating in Vietnam, vaccination is the best way forward to control the disease despite doubts from some quarters about its efficacy and/or possible side effects. This is because the risk of death for a vaccinated person is significantly reduced, even if the same person is subsequently infected.

Vietnam seemingly encountered an unsettling new phase with a sharp increase in confirmed COVID-19 cases in the presence of a new hybrid variant, the Delta variant. According to CDC, the Delta variant is more than twice as contagious as early forms of SARS-CoV-2 [84]. Similar to previous COVID-19 waves, Vietnam has taken approaches such as self-quarantine, designated quarantine camps, containment zones, and contact tracing. However, the rapid transmission of the new strain has presented Vietnamese high authorities with major challenges to bringing the situation under control. Moreover, statistics in Canada and Scotland suggest that compared to those contracting Alpha or original

virus strains, unvaccinated individuals infected with the Delta variant run higher risks of hospitalization and severe illness [85, 86]. It is noted that with reference to breakthrough infections, the Delta variant produced the same amount of virus in the body of both fully vaccinated and unvaccinated people, but vaccinated patients show mild symptoms and experience shorter periods of infection compared to unvaccinated ones [84, 87]. Low vaccination coverage and the increased transmissibility and disease severity of the Delta variant account for the recently accelerated COVID-19 mortality rate in Vietnam with an average number of roughly 300 deaths. Vaccines are still in short supply in Vietnam because developing countries are put at a disadvantage in the highly competitive race for COVID-19 vaccines [88]. Although there are chances of breakthrough infections, vaccines are proven effective for any types of new strains, namely, milder illness, quicker recovery, and low hospitalization and mortality probabilities [89-92]. Notably, the Pfizer/BioNTech vaccine and the AstraZeneca vaccine have been proven effective against the dangerous highly transmissible Delta variant after two doses [93]. Compared to other developing countries such as Thailand, the number of confirmed cases in Vietnam is still much smaller, but, due to a low vaccination rate, Vietnam has suffered a higher death rate [94]. Hence, when the Zero-COVID-19 strategy appears unfeasible to pursue, vaccines serve as a key factor to the long-term fight against the COVID-19 pandemic.

The global economy has been hit hard by COVID-19. Only a few countries have experienced positive economic growth during the last year. Strong public health measures, while necessary to prevent and suppress the pandemic, have imposed a severe toll on everyday lives and caused rising incidences of social problems (e.g., domestic violence) [95]. In view of this despairing trade-off between public health and livelihoods, the Vietnamese government established dual objectives of maintaining acceptable economic growth rates and controlling the pandemic. Timely social isolation and a cessation of economic activities would save thousands of lives and minimize loss since major outbreaks take a much longer period of time and much larger number of resources to bring the situation under control. The establishment of the Vaccine Fund is a deft policy move by the Vietnamese government to secure sustainable financial resources from the private sector to help fund vaccine procurement. On this point, Prime Minister Pham Minh Chinh stated that

"The fight against COVID-19 with a vaccine will have to go a long way and we have to inject people every year" [96]. The government has also approved many major infrastructure projects to support the economy, such as the My Thuan - Can Tho expressway, the Long Thanh airport, and three additional sections for the North - South expressway [97, 98]. Hence, the Vaccine Fund helps to reduce mounting fiscal burdens on the national budget, which is important as the pandemic has slowed economic activities substantially [99].

The establishment of the Vaccine Fund involved the entire political system in Vietnam - the Politburo, the Secretariat, the central government, and the Vietnam Fatherland Front - where the Vietnam Fatherland Front is the main agency responsible for calling for contributions from individuals and businesses. This approach is consistent with the Vietnamese ethos of "the people against foreign enemies" [82]. Additionally, the government hopes to demonstrate its steadfast determination in combating COVID-19 and bolster public trust through statements like "openness, transparency, and effective use of funds for the right purposes" [96]. Public trust in government and authorities also greatly contribute to the success of the COVID-19 Vaccine Fund, with an exceedingly high number of over 100 billion VND donated for vaccine-related activities such as purchases, research, and programme rollouts.

Cultural values have become a key fulcrum for the Vietnamese in standing up to adversity. According to Hofstede Insights, Vietnam scores only 20 on the individualism dimension, suggesting a collectivistic society [100]. Loyalty in a collectivist culture is paramount and overrides most other societal rules and regulations. Such a society fosters strong relationships where everyone takes responsibility for fellow members of their group. During the COVID-19 pandemic, this trait manifests itself in the national consensus to follow the pandemic policy rules closely. The population has rallied around the slogan of "fighting the pandemic is like fighting against the enemy" as a sign to show patriotism and national pride. Governmental policies and citizen's approval and compliance should go hand in hand to be conducive to a successful combat against common problems. When the COVID-19 vaccines were in its development stage, the Vietnamese government took more drastic measures compared to other countries all over the world, prioritizing contact tracing and introducing stringent regulations

on movement restriction to stop the spread of COVID-19. Our contact tracing method is unique and comprehensive because it categorized the contact degree into five levels starting with F0 (the infected individual), then F1 (those in close contact with F0 or being suspected of being infected) and F2 (those in close contact with F1), and all the way up to F5. Partly due to the great internal strength steeped in Vietnamese culture, the public have followed the pandemic policy rules closely to keep infection and death rates in the country some of the lowest in the world. One can argue that Vietnam is fighting the pandemic through not only policies and technology, but the third arrow is cultural values that raise national solidarity. Despite difficult economic circumstances, businesses and individuals have donated enthusiastically to the Vaccine Fund such the total number exceeded the target (5.5 trillion VND), ahead of expectations [96]. This third arrow of cultural values can explain the relatively low vaccine hesitancy rate in Vietnam, which also contributes to a smoother rollout [101].

Vietnamese government shows flexibility in its vaccine-related policies, evidenced by fully exploiting bilateral and multilateral relationships [102] to boost the vaccine supply. Vaccine diplomacy, currently an all-embracing term, has been emphasized as Vietnam's key solution to vaccine shortages. Significantly reduced new cases and death tolls are indicators of governmental quick responses and effective policymaking. This provides implications for developing countries of which seeking outside assistance should be stepped up to enable effective COVID-19 vaccine roll-out plans.

As the competition of buying vaccines is fierce, poor countries will find it difficult to procure sufficient supply in a short span of time. In fact, the biggest issue for developing countries is insufficient financial means, which also complicates the negotiation process with pharmaceutical companies. Meanwhile, vaccine assistance from wealthier nations is either limited or takes a long time to organize. Instead of relying solely on outside assistance, the Vaccine Fund can be a useful strategy for some developing countries to raise funds internally from the private sector and the expatriate network to boost the chances of securing vaccines. Overall, government and high authorities should be flexible in its response to COVID-19 by making the most use of both internal resources and external support in the fight against the invisible enemy.

With a combination of measures and policies that draw up support from internal and external forces, the Vietnamese government has significantly increased the national vaccination rate and brought the COVID-19 situation under control as evidenced by the consistently decreasing figure of new daily infected cases and a low death rate (0.4%) [81]. In recent months, Vietnam has reached a new normalcy in which all economic activities are resumed, restrictions on movement are relaxed, and COVID-19 has become less of a concern to the general public. Hence, the economy is expected to gradually bounce back in the coming time.

7. Conclusions and lesson learned

COVID-19 seems to have gone strength to strength sparing no countries or regions around the world. As COVID-19 mutates into new variants, countries will have to contend with possibly more severe outbreaks in the future. Moreover, we witnessed COVID-19 vaccines were in short supply globally in the past, which has resulted in huge, uneven gaps in vaccine distribution between rich and poor countries. Given this backdrop, our study examines the pandemic policy responses of the Vietnamese government; in particular, the establishment of a Vaccine Fund to mobilize financial resources from the private sector to assist with funding various vaccine activities and relieve fiscal burdens on the government budget. By systematically reviewing all relevant documents issued by the central and provincial authorities since the onset of the pandemic, particularly focusing on financial policies and the Vaccine Fund, we can summarize our findings into five points.

Firstly, the government plays a central role in dictating the ultimate success of the pandemic management campaign. During the pandemic, the government promulgates policies, supervises policy implementation, and enforces policy directives. The government is directly involved in all pandemic management activities ranging from technology application, vaccine procurement and research, communication to raise community awareness, mobilization of the population to participate in the pandemic campaign through the Vaccine Fund, and negotiations with other countries for vaccine donations and purchases.

Secondly, the availability of designated financial resources is critical for the viability of the campaign. To this end, the Vaccine Fund was designed to secure

additional financial resources from the private sector to supplement public expenditures on vaccine activities. However, it also serves as a conduit for boosting public trust through its open and transparent operation.

Thirdly, cultural values can be an important driving force to unite the citizens in support of the government pandemic policies. Massive donations to the Vaccine Fund in a short period of time demonstrate solidarity in businesses and individuals to rally behind the government in overcoming this national crisis together. This is a unique “anti-pandemic” cultural tradition, which boosts the overall national effort to vanquish the pandemic.

Fourthly, vaccine diplomacy should be promoted to boost public access to COVID-19 vaccines. Developing countries are far behind in the competition for vaccine purchases, so it is imperative to facilitate cooperation in vaccine supply with wealthy countries in the form of donations, negotiation, and technology transfer.

Finally, there is no “one-size-fits-all” policy framework. Rather, a suite of policy measures-5Ks, technology, vaccines and vaccine diplomacy - must be co-ordinated to give Vietnam the best chance to fully suppress the virus in the long run.

CRediT author statement

Quy Van Khuc: Conceptualisation, Methodology, Validation, Formal analysis, Writing - Original draft preparation, Writing - Reviewing and Editing, Visualisation, Supervision; Shawn Leu: Writing - Original draft preparation, Writing - Reviewing and Editing, Validation; Hien Nguyen: Data curation, Writing - Original draft preparation; Nguyen Truc Le: Validation, Writing - Reviewing and Editing; Thuy Nguyen: Writing - Original draft preparation, Writing - Reviewing and Editing; Hoang Khac Lich: Validation, Writing - Reviewing and Editing; Thi-Hong Nguyen: Data curation, Writing - Reviewing and Editing; Nguyen Thuy Anh: Validation, Writing - Reviewing and Editing; Duc-Bao Nguyen: Validation, Writing - Reviewing and Editing; Thang Ngo: Data curation, Visualisation, Writing - Original draft preparation; Phu Pham: Data curation, Visualisation, Writing - Reviewing and Editing; Le Thanh Ha: Validation, Writing - Reviewing and Editing; Phuong Luu: Validation, Writing - Reviewing and Editing; Nguyen Duc Lam: Validation, Writing - Reviewing and Editing; Trung Tran: Visualisation, Writing - Reviewing and Editing.

ACKNOWLEDGEMENTS

The authors are whole-heartedly grateful to the people for their support and consideration during data collection. We would also like to express our sincere thanks to two anonymous reviewers who provided constructive comments to improve the paper's quality.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] World Health Organisation (2022), *WHO Coronavirus (COVID-19) Dashboard*, <https://covid19.who.int/>, accessed 22 April 2022.
- [2] Ankita Bhandari (2021), "WHO says India COVID variant found in 44 countries, of global concern", <https://zeenews.india.com/india/who-says-india-covid-variant-found-in-44-countries-of-global-concern-2384365.html>, accessed 25 April 2022.
- [3] Centers for Disease Control and Prevention (2022), "Variants of the virus", <https://www.cdc.gov/coronavirus/2019-ncov/variants/>, accessed 25 April 2022.
- [4] F.E. Andre, R. Booy, H.L. Bock, et al. (2008), "Vaccination greatly reduces disease, disability, death and inequity worldwide", *Bull. World Health Organ.*, **86**, pp.140-146, DOI: 10.2471/blt.07.040089.
- [5] E.A. Harrison, J.W. Wu (2020), "Vaccine confidence in the time of COVID-19", *Eur. J. Epidemiol.*, **35**(4), pp.325-330, DOI: 10.1007/s10654-020-00634-3.
- [6] Centers for Disease Control and Prevention (1999), "Ten great public health achievements - United States, 1900-1999", *Morbidity and Mortality Weekly Report*, **48**(2), pp.241-243.
- [7] Our World in Data (2021), "How many vaccine doses have been administered in total?", <https://ourworldindata.org/covid-vaccinations>, accessed 25 April 2022.
- [8] H. Murphy, C. Yeginsu, C.D. Leon, et al. (2021), "With tears, hugs and balloons, U.S. allows vaccinated foreign travelers to enter", *The New York Times*, <https://www.nytimes.com/2021/11/08/travel/usa-travel-restrictions.html>, accessed 12 July 2022.
- [9] O.J. Wouters, P.K.C. Shadlen, M. Salcher-Konrad, et al. (2021), "Challenges in ensuring global access to COVID-19 vaccines: Production, affordability, allocation, and deployment", *Lancet*, **397**, pp.1023-1034, DOI: 10.1016/S0140-6736(21)00306-8.
- [10] Our World in Data (2022a), "Coronavirus (COVID-19) vaccinations", <https://ourworldindata.org/covid-vaccinations>, accessed 25 April 2022.
- [11] Our World in Data (2022b), "Share of people who completed the initial COVID-19", <https://ourworldindata.org/grapher/sharepeople-fully-vaccinated-covid?tab=map&time=2022-03-31>, accessed 27 April 2022.
- [12] Worldometer (2022), *Vietnam Population*, <https://www.worldometers.info/world-population/vietnam-population/>, accessed 29 April 2022.
- [13] Ministry of Health (2021), *The Information Page on The COVID-19 Pandemic*, <https://ncov.moh.gov.vn/vi/web/guest/trang-chu>, accessed 25 April 2022.
- [14] T. Nguyen (2022), "Bac Giang: An emerging investment destination", *Vietnam Briefing News*, <https://www.vietnam-briefing.com/news/bac-giang-emerging-investment-destination.html/>, accessed 25 April 2022.
- [15] T.A.T. Le, K. Vodden, J. Wu, et al. (2021), "Policy responses to the COVID-19 pandemic in Vietnam", *Int. J. Environ. Res. Public Health*, **18**(2), DOI: 10.3390/ijerph18020559.
- [16] K. Vu (2021), "Vietnam sets up vaccine fund amid biggest outbreak of COVID-19", *Reuters*, <https://www.reuters.com/world/asia-pacific/vietnam-sets-up-vaccine-fund-amid-biggest-outbreak-covid-19-2021-05-26/>, accessed 25 April 2022.
- [17] Vietnam News Agency (2020), "Vietnam reports first novel coronavirus infection cases", *Vietnam+*, <https://en.vietnamplus.vn/vietnamreports-first-novel-coronavirus-infection-cases/167729.vnp>, accessed 25 April 2022.
- [18] H. Van (2020), "Khanh Hoa province confirms the first COVID-19 infection case", <https://ninhhoa.khanhhoa.gov.vn/vi/tin-noi-bat/tinh-khanh-hoa-ghi-nhan-ca-dau-tien-mac-benh-viem-duong-ho-hap-cap-do-chung-moi-cua-virus-corona-gay-ra>, accessed 25 April 2022 (in Vietnamese).
- [19] V. Tuan (2020), "Vietnam declares novel coronavirus epidemic", *VnExpress International*, <https://e.vnexpress.net/news/news/vietnam-declares-novel-coronavirus-epidemic-4048991.html>, accessed 25 April 2022.
- [20] T. Dung (2020), "Vietnam confirms 17th COVID-19 infection case, first in Hanoi", *Government News*, <https://en.baochinhphu.vn/vn-confirms-17th-covid-19-infection-case-first-in-ha-noi-11137590.htm>, accessed 25 April 2022.
- [21] V. Nhu (2020), "Vietnam to go into 15-day nationwide social distancing to curb COVID-19", *Government News*, <https://en.baochinhphu.vn/viet-nam-to-go-into-15-day-nationwide-social-distancing-to-curb-covid-19-11137833.htm>, accessed 25 April 2022.
- [22] J. Pearson (2020), "Vietnam offers cut-price paradise to lure local travellers post coronavirus", *Reuters*, <https://www.reuters.com/article/uk-health-coronavirus-vietnam-tourismidUKKBN22V15U>, accessed 25 April 2022.
- [23] L. Nga (2020), "Vietnam confirms first case of COVID-19 community transmission in 100 days", *VnExpress International*, <https://e.vnexpress.net/news/news/vietnam-confirms-first-case-of-covid-19-community-transmission-in-100-days-4135963.html>, accessed 25 April 2022.
- [24] V.M. Nong, Q.L.T. Nguyen, T.T. Doan, et al. (2021), "The second wave of COVID-19 in a tourist hotspot in Vietnam", *J. Travel Med.*, **28**, pp.1-3, DOI: 10.1093/JTM/TAAA174.

- [25] N. Dong (2020), "Government imposes social distancing in Da Nang as COVID-19 resurfaces", *VnExpress International*, <https://e.vnexpress.net/news/news/government-imposes-social-distancing-in-da-nang-as-covid-19-resurfaces-4136742.html>, accessed 25 April 2022.
- [26] T. Dung (2020), "Da Nang officially sets up Tien Son field hospital", *Government News*, <https://en.baohinhphu.vn/da-nang-officially-sets-up-tien-son-field-hospital-11139108.htm>, accessed 25 April 2022.
- [27] World Health Organisation (2020a), *Vietnam COVID-19 Situation Report 08*, <https://www.who.int/vietnam/internal-publications-detail/covid-19-in-viet-nam-situation-report-08>, accessed 25 April 2022.
- [28] World Health Organisation (2020b), *Vietnam COVID-19 Situation Report 21*, <https://www.who.int/vietnam/internal-publications-detail/covid-19-in-viet-nam-situation-report-21>, accessed 25 April 2022.
- [29] L. Pham (2021), "Four coronavirus variants found in Vietnam", *Hanoitimes*, <http://hanoitimes.vn/four-coronavirus-variants-found-in-vietnam-316284.html>, accessed 25 April 2022.
- [30] World Health Organisation (2020c), *Vietnam COVID-19 Situation Report 35*, <https://www.who.int/vietnam/internal-publications-detail/covid-19-in-viet-nam-situation-report-35>, accessed 25 April 2022.
- [31] T.H. Yee (2021), "Vietnam's 4th wave of COVID-19 is its first 'real wave', after earlier blips", *The Straits Times*, <https://www.straitstimes.com/asia/se-asia/vietnams-4th-waveof-covid-19-is-its-first-real-wave-after-earlier-blips>, accessed 25 April 2022.
- [32] V. Hai, C. Le, H. Phuong, et al. (2021), "Hanoi frontline hospital in COVID-19 fight locked down", *VnExpress International*, <https://e.vnexpress.net/news/news/hanoi-frontline-hospital-in-covid-19-fight-locked-down-4273128.html>, accessed 25 April 2022.
- [33] T. Son (2022), "COVID-19 cases as of March 31: 80,838 new cases, deaths plunged", *People's Army Newspaper*, <https://www.qdnd.vn/y-te/tin-tuc/ca-nhiem-covid-ngay-31-3-them-80-838-f0-ca-tu-vong-ca-nuoc-giam-manh-690314>, accessed 25 April 2022 (in Vietnamese).
- [34] General Statistics Office (2022), "Socio-economic situation in the fourth quarter and 2021", <https://www.gso.gov.vn/en/data-and-statistics/2022/01/socio-economic-situation-in-the-fourth-quarter-and-2021/>, accessed 25 April 2022.
- [35] General Statistics Office (2021), "Report on the COVID-19 impacts on labour and employment situation in the third quarter of 2021", <https://www.gso.gov.vn/en/data-and-statistics/2021/10/report-on-the-covid-19-impacts-on-labour-and-employment-situation-in-the-third-quarter-of-2021/>, accessed 25 April 2022.
- [36] K. Bao (2021), "Prime Minister launches largest-ever vaccination campaign for 75 million people", <https://daklak.gov.vn/web/english/-/prime-minister-launches-largest-ever-vaccination-campaign-for-75-million-people>, accessed 25 April 2022.
- [37] T. Dung (2022), "Vietnam completes first COVID-19 vaccine dose for all adults", *Government News*, <https://en.baohinhphu.vn/viet-nam-completes-first-covid-19-vaccine-dose-for-all-adults-111220114155852875.htm>, accessed 25 April 2022.
- [38] Vietnamnews (2022), "Vietnam administers 198 mln COVID-19 vaccine doses, one year on from start of historic campaign", <https://vietnamnews.vn/society/1162701/viet-nam-administers-198mln-covid-19-vaccine-doses-one-year-on-from-start-of-historic-campaign.html>, accessed 25 April 2022.
- [39] V. Tuan (2022), "Vietnam to reopen international tourism from March 15", *VnExpress International*, <https://e.vnexpress.net/news/travel/vietnam-to-reopen-international-tourism-from-march-15-4428237.html>, accessed 25 April 2022.
- [40] V. Hai (2022), "Hanoi allows restaurants, cafes to open until midnight", *VnExpress International*, <https://e.vnexpress.net/news/news/hanoi-allows-restaurants-cafes-to-open-until-midnight-4439214.html>, accessed 25 April 2022.
- [41] M.C. Paules, H.D. Marston, A.S. Fauci (2020), "Coronavirus infections - more than just the common cold", *Assess. Eval. High. Educ.*, **37**, DOI: 10.1001/jama.2020.0757.
- [42] P. Poletti, M. Tirani, D. Cereda, et al. (2020), "Probability of symptoms and critical disease after SARS-CoV-2 infection", *ArXiv, Cornell Univ.*, **4(3)**, DOI: 10.48550/arXiv.2006.08471.
- [43] A.S. Fauci, H.C. Lane, R.R. Redfield (2020), "COVID-19 - Navigating the uncharted", *N. Engl. J. Med.*, **382**, pp.1268-1269, DOI: 10.1056/nejme2002387.
- [44] L. Zou, F. Ruan, M. Huang, et al. (2020), "SARS-CoV-2 viral load in upper respiratory specimens of infected patients", *N. Engl. J. Med.*, **382(13)**, DOI: 10.1056/nejmc2001737.
- [45] J.B. Aguilar, J.S. Faust, L.M. Westafer, et al. (2020), "Investigating the impact of asymptomatic carriers on COVID-19 transmission", *Medrxiv*, DOI: 10.1101/2020.03.18.20037994v3.
- [46] B. Korber, W.M. Fischer, S. Gnanakaran, et al. (2020), "Tracking changes in SARSCoV-2 spike: Evidence that D614G increases infectivity of the COVID-19 virus", *Cell*, **182(4)**, pp.812-827, DOI: 10.1016/j.cell.2020.06.043.
- [47] M.D. Knoll, C. Wonodi (2021), "Oxford - AstraZeneca COVID-19 vaccine efficacy", *Lancet*, **397(10269)**, pp.72-74, DOI: 10.1016/S0140-6736(20)32623-4.
- [48] International Hospitality Management in English (2021), "COVID-19 vaccine efficacy summary", <http://www.healthdata.org/covid/covid-19-vaccine-efficacy-summary>, accessed 1 August 2021.
- [49] T.P. Velavan, A.J. Pollard, P.G. Kremsner (2020), "Herd immunity and vaccination of children for COVID-19", *Int. J. Infect. Dis.*, **98**, pp.14-15, DOI: 10.1016/j.ijid.2020.06.065.
- [50] W. Lim, P. Zhang (2020), "Herd immunity and a vaccination game: An experimental study", *PLOS ONE*, **15(5)**, DOI: 10.1371/journal.pone.0232652.
- [51] H. Harapan, A.L. Wagner, A. Yufika, et al. (2020), "Acceptance of a COVID-19 vaccine in southeast asia: A cross-sectional study in Indonesia", *Front. Public Heal.*, **8**, DOI: 10.3389/fpubh.2020.00381.

- [52] S. Neumann-Böhme, N.E. Varghese, I. Sabat, et al. (2020), "Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19", *Eur. J. Heal. Econ.*, **21**, pp.977-982, DOI: 10.1007/s10198-020-01208-6.
- [53] L.P. Wong, H. Alias, P.F. Wong, et al. (2020), "The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay", *Hum. Vaccines Immunother.*, **16**(9), pp.2204-2214, DOI: 10.1080/21645515.2020.1790279.
- [54] Y. Lin, Z. Hu, Q. Zhao, et al. (2020), "Understanding COVID-19 vaccine demand and hesitancy: A nationwide online survey in China", *PLOS Negl. Trop. Dis.*, **14**(12), DOI: 10.1371/journal.pntd.0008961.
- [55] W.A. Al-Qerem, A.S. Jarab (2021), "COVID-19 vaccination acceptance and its associated factors among a middle eastern population", *Front. Public Heal.*, **9** DOI: 10.3389/fpubh.2021.632914.
- [56] A.A. Cerda, L.Y. Garcia (2019), "Hesitation and refusal factors in individuals' decision-making processes regarding a coronavirus disease 2019 vaccination", *Front. Public Heal.*, **9**, DOI: 10.3389/fpubh.2021.626852.
- [57] World Health Organisation (2021), *Essential Programme on Immunization*, <https://www.who.int/teams/immunization-vaccines-and-biologicals/essential-programme-on-immunization/supply-chain/>, accessed 14 February 2022.
- [58] C.A. Latkin, L. Dayton, G. Yi, et al. (2021), "Trust in a COVID-19 vaccine in the U.S.: A social-ecological perspective", *Soc. Sci. Med.*, **270**, DOI: 10.1016/j.socscimed.2021.113684.
- [59] J.V. Lazarus, S.C. Ratzan, A. Palayew, et al. (2021), "A global survey of potential acceptance of a COVID-19 vaccine", *Nat. Med.*, **27**(2), pp.225-228, DOI: 10.1038/s41591-020-1124-9.
- [60] F. Kreier (2021), "Unprecedented achievement: Who received the first billion COVID vaccinations?", *Nature*, DOI: 10.1038/d41586-021-01136-2.
- [61] E.M. Choi (2021), "COVID-19 vaccines for low-and middle-income countries", *Trans. R. Soc. Trop. Med. Hyg.*, **115**(5), pp.447-456, DOI: 10.1093/trstmh/tra045.
- [62] K. Vu (2021), "Vietnam to set up \$1.1 bln COVID-19 vaccine fund", *Reuters*, <https://www.reuters.com/world/asia-pacific/vietnam-set-up-11-bln-covid-19-vaccine-fund-2021-05-20/>, accessed 25 April 2022.
- [63] T. Van (2021), "A cutback of at least 50% in conference expenses and an additional 10% cutback in recurrent expenditures", *Government News*, <https://baohinhphu.vn/cat-giam-toi-thieu-50-kinh-phi-hoi-nghi-tiet-kiem-them-10-chi-thuong-xuyen-de-bo-sung-nguon-phong-chong-dich-covid-19-102293872.htm>, accessed 25 April 2022 (in Vietnamese).
- [64] F. Rahim, R. Allen, H. Barroy, et al. (2020), "COVID-19 funds in response to the pandemic", *IMF*, <https://data.imf.org/GFS>, accessed 25 April 2022.
- [65] H. Hanh, T. Hang (2021), "Vietnam's COVID-19 Vaccine Fund binds hearts together in fight against pandemic", *Nhan Dan Newspaper*, <https://en.nhandan.vn/202106vaccinefund/>, accessed 25 April 2022.
- [66] M. Quoc (2021), "Mobilization of funding sources from the whole society to buy vaccines to repel COVID-19", *Nhan Dan Newspaper*, <https://nhandan.vn/ban-doc-viet/xa-hoi-hoa-nguon-kinh-phi-mua-vac-xin-day-lui-covid-19-638281/>, accessed 25 April 2022 (in Vietnamese).
- [67] Clifford Chance (2020), "Coronavirus: Government financial aid to business an international guide", <https://www.cliffordchance.com/content/dam/cliffordchance/briefings/2020/03/coronavirus-government-financial-aid-to-business-an-international-guide.pdf>, accessed 30 November 2021.
- [68] Organization for Economic Cooperation and Development (2020), "COVID-19 government financing support programmes for businesses", www.oecd.org/finance/COVID-19-Government-Financing-Support-Programmes-for-Businesses.pdf, accessed 30 November 2021.
- [69] K.D. Bailey (1994), *Methods of Social Research*, The Free Press.
- [70] Q.H. Vuong, V.P. La, M.T. Ho, et al. (2021), "A data collection on secondary school students' STEM performance and reading practices in an emerging country", *Data Intell.*, **3**(2), DOI: 10.1162/dint_a_00091.
- [71] M. Hien (2021), "30% reduction of annual corporate income tax", *VGP News*, <http://baohinhphu.vn/Chi-dao-quyetdinh-cua-Chinh-phu-Thu-tuong-Chinh-phu/Giam-30-thue-thunhap-doanh-nghiep-phai-nop-nam-2020/408869.vgp>, accessed 24 April 2022 (in Vietnamese).
- [72] The Government of Vietnam (2020), *Decree 41/2020/ND-CP Extending The Deadline for Paying Tax and Land Rent*, <https://luatvietnam.vn/dat-dai/nghi-dinh-41-2020-nd-cp-gia-han-thoi-han-nop-thue-va-tien-thue-dat--182323-d1.html>, accessed 24 April 2022 (in Vietnamese).
- [73] Vietnamese Consumption (2021), "The State Bank of Vietnam continues to reduce a series of operating interest rates, effective from October 1", <https://tapchitaichinh.vn/ngan-hang/ngan-hang-nha-nuoc-tiep-tuc-giam-manh-mot-loat-lai-suat-dieu-hanh-co-hieu-luc-tu-ngay-0110-328349.html>, accessed 24 April 2022 (in Vietnamese).
- [74] P.T.T. Van (2021), "Financial policies to support businesses to cope with the pandemic", https://mof.gov.vn/webcenter/portal/vclvcstc/pages_r/l/chi-tiet-tin?dDocName=MOFUCM195005, accessed 24 April 2022 (in Vietnamese).
- [75] M. Duyen (2021), "Support package of 62 trillion VND: Proposal to expand the support object", <https://dangcongsan.vn/xa-hoi/goi-ho-tro-62-nghin-ty-dong-de-xuat-mo-rong-doi-tuong-ho-tro-564548.html>, accessed 24 April 2022 (in Vietnamese).
- [76] HA.NV (2021), "The second COVID-19 support package needs to be focus on business group", <https://dangcongsan.vn/kinh-te-va-hoi-nhap/goi-ho-tro-covid-19-lan-hai-can-cu-the-va-di-vao-nhom-doi-tuong-doanh-nghiep-563992.html>, accessed 24 April 2022 (in Vietnamese).
- [77] The Government of Vietnam (2020), *Decree No. 81/2020/ND-CP of The Government*, http://vanban.chinhphu.vn/portal/page/portal/chinhphu/hethongvanban?class_id=1&_page=1&mode=detail&document_id=200490, accessed 24 April 2022 (in Vietnamese).

- [78] National Economics University and Consultants JICA (2020), "Evaluation of COVID-19 response policies and recommendations", https://www.jica.go.jp/vietnam/english/office/topics/c8h0vm0000ecmc4u-att/210305_02_vn.pdf, accessed 24 April 2022 (in Vietnamese).
- [79] Vietnam News (2021), "Special working group on vaccine diplomacy to fight COVID-19", <https://vietnamnews.vn/opinion/1015229/special-working-group-on-vaccine-diplomacy-to-fight-covid-19.html>, accessed 11 November 2021.
- [80] World Health Organisation - Ministry of Health Vietnam (2021), *Vietnam COVID-19 Situation Report #65*, https://www.who.int/docs/default-source/wpro---documents/countries/vietnam/covid-19/viet-nam-moh-who-covid-19-sitrep_24oct2021.pdf?sfvrsid=210305_02_vn, accessed 30 November 2021.
- [81] Reuters (2022), *COVID-19 Tracker - Vietnam*, <https://graphics.reuters.com/world-coronavirus-tracker-and-maps/countries-and-territories/vietnam/>, accessed 24 April 2022.
- [82] V.P. La, T.H. Pham, M.T. Ho, et al. (2020), "Policy response, social media and science journalism for the sustainability of the public health system amid the COVID-19 outbreak: The Vietnam lessons", *Sustain.*, **12**(7), DOI: 10.3390/su12072931.
- [83] Q.V. Nguyen, D.A. Cao, S.H. Nghiem (2021), "Spread of COVID-19 and policy responses in Vietnam: An overview", *Int. J. Infect. Dis.*, **103**, pp.157-161, DOI: 10.1016/j.ijid.2020.11.154.
- [84] National Center for Immunization and Respiratory Diseases (U.S.). Division of Viral Diseases (2021), "COVID-19 delta variant: What we know about the science", <https://stacks.cdc.gov/view/cdc/108671>, accessed 25 August 2021.
- [85] A. Sheikh, J. McMenamin, B. Taylor, et al. (2021), "SARS-CoV-2 delta VOC in Scotland: Demographics, risk of hospital admission, and vaccine effectiveness", *Lancet*, **397**(10293), pp.2461-2462, DOI: 10.1016/S0140-6736(21)01358-1.
- [86] D.N. Fisman, A.R. Tuite (2021), "Progressive increase in virulence of novel SARS-CoV-2 variants in Ontario, Canada", *MedRxiv*, <https://www.medrxiv.org/content/10.1101/2021.07.05.21260050v2.full.pdf+html>, accessed 25 August 2021.
- [87] UC Davis Health (2021), "Delta variant: 8 things you should know about this COVID-19 strain", <https://health.ucdavis.edu/coronavirus/covid-19-information/delta-variant.html>, accessed 25 August 2021.
- [88] Organization for Economic Cooperation and Development (2021), "Coronavirus (COVID-19) vaccines for developing countries: An equal shot at recovery", <https://www.vietnamplus.vn/nghe-an-bai-toan-ve-cong-viec-tao-sinh-ke-cho-nguoi-hoi-huong/746879.vnp>, accessed 25 August 2021 (in Vietnamese).
- [89] J.L. Bernal, N. Andrew, C. Gover, et al. (2021), "Effectiveness of the PfizerBioNTech and Oxford-AstraZeneca vaccines on COVID-19 related symptoms, hospital admissions, and mortality in older adults in England: Test negative case-control study", *BMJ*, **373**, DOI: 10.1136/bmj.n1088.
- [90] E. Vasileiou, P.C.R. Simpson, T. Shi, et al. (2021), "Interim findings from first-dose mass COVID-19 vaccination roll-out and COVID-19 hospital admissions in Scotland: A national prospective cohort study", *Lancet*, **397**(10285), pp.1646-1657, DOI: 10.1016/S0140-6736(21)00677-2.
- [91] C. Pawlowski, P. Lenehan, A. Puranik, et al. (2021), "FDA-authorized mRNA COVID-19 vaccines are effective per real-world evidence synthesized across a multi-state health system", *Med.*, **2**(8), pp.979-992, DOI: 10.1016/j.medj.2021.06.007.
- [92] N. Dagan, N. Barda, E. Kepten, et al. (2021), "BNT162b2 mRNA COVID-19 vaccine in a nationwide mass vaccination setting", *N. Engl. J. Med.*, **384**, pp.1412-1423, DOI: 10.1056/nejmoa2101765.
- [93] UK Government (2021), "Vaccines highly effective against hospitalisation from delta variant", <https://www.gov.uk/government/news/vaccines-highly-effective-against-b-1-617-2-variant-after-2-doses>, accessed 6 August 2021.
- [94] B. Katharina (2021), "The COVID-19 vaccination race in Asia, statista", <https://www.statista.com/chart/24463/vaccination-race-asia-coronavirus/>, accessed 27 August 2021.
- [95] K. Usher, N. Bhullar, J. Durkin, et al. (2020), "Family violence and COVID-19: Increased vulnerability and reduced options for support", *Int. J. Ment. Health Nurs.*, **29**, pp.549-552, DOI: 10.1111/inm.12735.
- [96] V. Tuan, H. Thuy (2021), "COVID-19 vaccine fund raises \$329 million", *VnExpress Int.*, <https://e.vnexpress.net/news/news/covid-19-vaccine-fund-raises-329-million-4289774.html>, accessed 24 April 2022.
- [97] D. Loan (2021a), "Government greenlights Long Thanh international airport", *VnExpress Int.*, <https://e.vnexpress.net/news/business/economy/government-greenlights-long-thanh-international-airport-4191101.html>, accessed 24 April 2022.
- [98] D. Loan (2021b), "2021 will be year of major projects", *VnExpress Int.*, <https://e.vnexpress.net/news/business/economy/2021-will-be-year-of-major-transport-projects-4215263.html>, accessed 24 April 2022.
- [99] The World Bank (2021), "The global economic outlook during the COVID-19 pandemic: A changed world", <https://www.worldbank.org/en/news/feature/2020/06/08/the-global-economic-outlook-during-the-covid-19-pandemic-a-changedworld>, accessed 24 April 2022.
- [100] Geert Hofstede (2010), "Vietnam - Hofstede insights", <https://www.hofstede-insights.com/country/vietnam/>, accessed 24 April 2022.
- [101] Q.V. Khuc, T. Nguyen, L. Pham, et al. (2021), "Young adults' intentions and rationales for COVID-19 vaccination participation: Evidence from a student survey in Ho Chi Minh city, Vietnam", *Vaccines*, **9**(7), DOI: 10.3390/vaccines9070794.
- [102] Q.H. Vuong, T.T. Le, V.P. La, et al. (2022), "COVID-19 vaccines production and societal immunization under the serendipitymindponge-3D knowledge management theory and conceptual framework", *Humanit. Soc. Sci. Commun.*, **9**(1), DOI: 10.1057/s41599-022-01034-6.

Climate justice in Vietnam's green transformation: A three-dimensional analysis of the green growth and climate change mitigation sectors

Hoang Khoi Nguyen*

Research Associate, Leuven International and European Studies (LINES), Faculty of Social Sciences,
University of Leuven, Oude Markt 13, 3000 Leuven, Belgium

Received 26 October 2022; revised 30 December 2022; accepted 23 January 2023

Abstract:

The ongoing international efforts in climate change mitigation - which includes reducing the emission of greenhouse gases (GHG) and increasing carbon sinks - are highly consequential to the long-term socio-economic stability of Vietnam. Vietnam has been making great strides in promoting a low-carbon development pathway to ensure high growth rates, environmental protection, and fulfilment of international climate change commitments. These efforts are concretised in the form of a green transformation policy framework of which the most important components are the National Green Growth Strategy for the period 2021-2030 and the National Climate Change Strategy for the period up to 2050. As these policies employ an integrated approach that aim to achieve economic growth and climate change mitigation simultaneously, there is a possibility that the social pillar of sustainable development may be neglected, potentially leading to issues with equity and fairness in planning and implementing concrete missions and tasks. This article seeks to determine whether this is the case by assessing how three dimensions of climate justice -namely recognition justice, procedural justice and distributive justice - are reflected in the Green Growth and Climate Change Strategies.

Keywords: climate change mitigation, climate justice, green growth, green transformation, social sustainability.

Classification numbers: 4.1, 5.1

1. Introduction

The ongoing international efforts in climate change mitigation - which includes reducing the emission of GHG and increasing carbon sinks - are highly consequential to the long-term socio-economic stability of Vietnam, which is among the five countries most vulnerable to the adverse impacts of climate change in the world [1]. Although the historical GHG emission of Vietnam is considerably lower than that of developed countries, as an emerging economy with rapidly rising emissions, Vietnam still has a responsibility to contribute to global mitigation efforts. Accordingly, at the 26th Conference of the Parties to the United Nations Framework Conference on Climate Change (COP26) in November 2021, Prime Minister Pham Minh Chinh on behalf of the government made the pledge that Vietnam will reach net zero emission by 2050. This not only reaffirms Vietnam's commitments to the international community but also

paves the way for a comprehensive transition to a low-carbon development model.

On this basis, since late 2021, Vietnam has approved numerous legal documents to fulfil this long-term objective such as Decision 888 on the Plan on missions and tasks to implement the COP26 outcome (COP26 Implementation Plan), Decision 892 on the National Strategy on climate change for the period up to 2050 (National Climate Change Strategy) and Decision 882 on the National Action Plan on Green Growth for the period for 2021-2030 (Green Growth Action Plan) to implement the Decision 1658 on the National Green Growth Strategy (Green Growth Strategy). In essence, these policies utilize an integrated, cross-sectoral approach that aims to simultaneously solve ecological and economic objectives [2], for example, by encouraging the domestic automobile industry to improve land transportation, create jobs, and reduce carbon dioxide emission. Although this policy

*Email: nguyenhkhoh@gmail.com

combination can theoretically achieve growth and climate change objectives, it does not take into account problems related to the social dimension - which is one of three pillars of sustainable development alongside the economic and environmental ones. Therefore, if social objectives in the green transformation are underrepresented, sustainable development will be difficult to achieve even when environmental and economic targets are fulfilled.

The social dimension in environmental and climate issues can be analysed through a variety of conceptual frameworks, for instance, environmental justice, just transition, or energy justice [3]. Despite being mostly applicable to specific ecological themes, these concepts generally share the same analytical tools. This article zooms in on the climate justice concept, as climate change mitigation is the shared and overarching objective of Vietnam's green transformation framework, which includes the Green Growth Policy and the Climate Change Strategy.

Climate justice refers to the protection and promotion of the legitimate rights and interests of vulnerable communities in the face of adverse impacts caused by both climate change as a natural phenomenon and efforts to mitigate GHG emission to stop climate change [4]. Climate justice is especially important for mitigation policies as the transition of the economy to a low carbon model has many implications for equity and justice. For example, the phase-out of coal - which is the most polluting fossil fuel - can raise electricity prices in the short term and take away low-skilled jobs, causing economic damages to low-income families, increasing unemployment rates, and sowing the seeds of social discontent.

Research has shown that ordinary citizens can develop a clear perception of the extent of equity and justice of mitigation policies [5, 6]. An equitable mitigation policy will achieve social approval, enabling the execution of controversial measures that can cause disturbances in the basic arrangements of the economy. Therefore, a just policy can improve its efficiency and also ensure that its implementation is free of hurdles.

Ever since the COP26 pledges, there has been an uptick in official endorsement of climate justice and equity in Vietnam. During COP26 itself, Prime Minister Pham Minh Chinh remarked that economic growth and climate change response in Vietnam must be consistent with equity and justice principles [7]. Domestically, the National Steering Committee on Implementing Vietnam's Commitments at COP26 has requested that ministries and sectors complete

a report on equitable and just transition in their sector before 15 August 2022. Nonetheless, through speeches delivered by national and regional leaders, commercial events, and other outreach activities on climate change mitigation that have proliferated since late 2021, it can be observed that the role of the social sustainability dimension remains underreported compared to the economic and environmental dimensions. This necessitates an initial project to determine the legal and theoretical basis for climate justice within Vietnam's green transformation framework.

2. Research design

The research design is an embedded case study, which contains multiple sub-units of analysis within a larger case [8]. The case here is the green transformation policy framework with the sub-units of analysis being the Green Growth Strategy and the Climate Change Strategy. The embedded case is chosen instead of the multi-case approach because the boundaries between the two units of analysis are not self-evident. In other words, the purpose of this research is not to compare and contrast the two strategies but to assess how they collectively contribute to the overall extent of climate justice as demonstrated in the green transformation framework.

Due to the recent introduction of these strategies, their implementation process remains in the very early phase. This prevents the assessment of climate justice in terms of policy outcome and impact. Therefore, the article focuses on the output aspect by employing a qualitative content analysis research method [9] to analyse the texts of the Green Growth Strategy and the Climate Change Strategy. The article attempts to address the research question: "To what extent are the dimensions of climate justice represented in Vietnam's green transformation policy framework?" The answer to this puzzle will help identify the advantages and shortcomings of the green transformation framework, allowing policymakers to improve the degree of equity and justice in the country's sustainable development efforts.

The rest of this article is divided into six sections. The very next section introduces the green transformation policy framework and the content of the most important policies. This is followed by an operationalization of the three dimensions of climate justice - namely recognition justice, procedural justice, and distributive justice. Then, the coding agenda to assess the extent of these dimensions' representation in the green transformation framework is introduced. Based on these coding rules, the results of the analysis

are presented and discussed. Some recommendations to enhance each of the dimensions are then provided in the penultimate section. Finally, the conclusion summarizes the findings and suggests future research directions.

3. Vietnam's green transformation policy framework

The green transformation framework is a collection of policies that share many similarities in terms of guiding visions, objectives and solutions in the fields of green growth, and climate change mitigation. This is a semi-official terminology that, despite not being formally defined in legal documents, is widely used by government agencies to refer to mutually reinforcing policies that regulate GHG reduction and transformation of the economic model [10]. The focal policies of this framework are the Green Growth Strategy and the Climate Change Strategy, respectively approved in November 2021 and July 2022. The dynamic policy framework centred around these two strategies is constantly evolving with the additions of implementation plans by specific Ministries, sectors, and local regions. In July 2022, the Green Growth Action Plan was released to guide the implementation of the Green Growth Strategy, while the Climate Change Strategy does not yet have an equivalent.

The Climate Change Strategy is nearly identical to the Plan to Implement COP26, which was also introduced in July 2022. The Climate Change Strategy is chosen to be one of the sub-units of analysis because it emphasizes domestic issues instead of focusing on fulfilling international commitments like the Plan to Implement COP26. Furthermore, analyses of two strategies, which are legal equivalents, will lead to more consistent findings than between a strategy and a plan. The choice of the Climate Change Strategy also ensures continuity with past works by international scholars, which have determined that the previous versions of Climate Change Strategy and the Green Growth Strategies were major components of the green transformation process [11].

The Climate Change Strategy was developed and supervised by the Ministry of Natural Resources and Environment (MONRE). The first version of this strategy was released in December 2011, followed by an Action Plan in 2012. In this period, the Climate Change Strategy mostly focused on climate change adaptation rather than mitigation [11]. A succession of international and domestic events, for example, the introduction of the Paris Agreement, the 17 Sustainable Development Goals of the United Nations in 2015,

and Vietnam's net zero commitments at COP26, soon rendered this version incompatible with reality. Since July 2022, the revised strategy has brought Vietnam's climate change policies closer to the international situation and the country's decarbonization drive. The current strategy prescribes three objectives: adapting to climate change and minimizing losses caused by adverse effects of climate change; mitigating GHG emission to achieve net zero emission by 2050; and leveraging opportunities created by climate change mitigation to transform the growth model and improve competitiveness. Since climate justice issues mostly stem from mitigation activities, the second and third objectives are more relevant to the article. To achieve these objectives, the Climate Change Strategy assigns responsibilities to local regions and socio-economic sectors, in particular, energy, industry, construction, agriculture, and transportation [12].

The Green Growth Strategy is drafted and overseen by the Ministry of Planning and Investment (MPI). This strategy was also first released in 2012 for the period 2012-2020 with three major objectives: reduce GHG emission; promote greening of economic sectors; and promote a green lifestyle and sustainable consumption. The first and third objectives are relevant to climate justice as they are concerned with promoting climate change mitigation and a lifestyle compatible with a decarbonized economy. In October 2021, this strategy was updated for the period 2021-2030 with vision towards 2050. The revised version adds a fourth objective, which is to ensure the equity, inclusiveness, and resilience principles [13]. Therefore, the Green Growth Strategy is highly relevant for the purpose of this article. In July 2022, the Green Growth Action Plan was approved in order to elucidate the precise tasks and missions of relevant Ministries, sectors, and local regions. In particular, there are 18 themes, 57 task clusters, and 134 tasks [14].

4. Three dimensions of climate justice in Vietnam's green transformation policy framework

This section introduces and operationalizes the three dimensions of climate justice. Indicators to assess the content of each dimension will also be used in the coding agenda in the very next section.

To this date, no single definition nor typology of climate justice has been universally accepted. Nonetheless, there are three dimensions of climate justice that are widely employed by scholars and governments around the world, namely, recognition justice, procedural justice, and distributive justice.

Recognition justice refers to acknowledgement of vulnerable communities that often bear the brunt of climate change with a view to granting them privileges and special treatment. Procedural justice refers to the rights of citizens, no matter their income level, gender, ethnicity, or geographic origin, to participate in the deliberation process that leads to the creation of climate policies that directly affect their livelihood. Distributive justice is achieved when there are policy measures that aim to distribute the costs and benefits of climate change actions in a fair manner among all citizens, with special focus on marginal groups. As such, we can conceptualize recognition as the basis, procedure as the process, and distribution as the outcome of climate justice.

Although all three dimensions can be applied to climate justice between countries, this article only focuses on the domestic level. The three dimensions are closely related and mutually reinforcing, which means that the absence of one dimension precludes the achievement of climate justice. Take for example, if equity and justice are not even considered a potential issue, then there is no legal basis to develop procedural and distributive measures. If procedural justice is not strong, vulnerable groups will have difficulty making their concerns be known to the government, which will then develop distributive measures that do not reflect the people's wishes. On the other hand, if a policy is distributionally just, citizens will strongly approve it and actively take part in consultations to improve it further. The article will now turn to the precise definition and indicators of the three dimensions of climate justice and assess the degrees of their representation in Vietnam's green transformation framework.

4.1. Recognition justice

Recognition justice advocates that mitigation policies must take into account potential impacts on vulnerable communities, which are often neglected in their formulation and implementation. This aspect is considered a stepping stone to achieve the other forms of climate justice, because we can only explore the causes of injustice if it is confirmed to exist in the first place.

The recognition dimension addresses both the natural and man-made causes of climate change injustice. For the former, recognition refers to the acknowledgement of the elevated risks to marginal

communities caused by the natural phenomenon of climate change [15]. For the latter, recognition justice admits that actions to mitigate climate change can also create or exacerbate existing injustice patterns [14]. More importantly, recognition must go beyond theoretical acknowledgement by granting vulnerable groups special rights and treatment, which are the bases for procedural and distributive justice measures [16].

4.2. Procedural justice

Procedural justice refers to the assurance of favourable conditions that allow the majority of a country's citizens to take part and influence policies that directly affect their livelihood [17]. Although the national government remains the most important subject in environmental and climate change governance, ordinary citizens must be allowed to raise their voices to ensure the fairness of policies that can strongly impact their employment and financial well-being. J. Pretty (1995) [18] identified seven levels of popular participation in environmental issues, which can be further encapsulated into two major types: passive and active participation. Passive methods include public consultation, discussion, and debate, while active methods allow the people to directly interact with government institutions to design and carry out policy measures.

Procedural justice emphasizes inclusiveness, meaning that all communities must be able to contribute to policy formulation, especially minority, marginal, and vulnerable ones [19]. Accordingly, there must be policies to empower women, the elderly, youths, low-income households, ethnic minorities, and people who suffer disproportionately from the green transformation in general. Procedural justice prioritizes the diversity of social groups, especially disadvantaged ones, over the number of individuals that can participate [20]. This is because vulnerable groups typically have a weaker understanding of mitigation policies and are less likely to vote due to financial and mobility constraints, thus allowing privileged groups to continue dominating the agenda. Therefore, procedural justice is normatively predisposed towards "quality" rather than "quantity".

4.3. Distributive justice

Distributive justice is achieved when the costs and benefits of climate change mitigation policies are fairly allocated among all social segments [19]. Many

research projects have pointed out that GHG reduction policies can directly or indirectly create or worsen livelihood difficulties of vulnerable groups [11]. For instance, measures to promote the electrification of private vehicles may add to the financial burden of low-income households, since the average price of electric cars remain much higher than cars running on diesel or gasoline. Meanwhile, as infrastructure for electric vehicles is not yet adequate for long-distance travel, this measure can isolate rural residents from urban centres, thus reducing social cohesion and solidarity.

Many distributive measures have been proven to be effective in reducing the burden caused by mitigation policies. Some of the more popular ones include: direct cash transfer, social policies such as pension and health insurance, investment in low-carbon infrastructure, reducing value-added tax, and capacity-building for green jobs [21]. While some authors have focused on what should be distributed and who should be the recipients [22], the technical nature of distributive measures have received less attention. No single policy instrument - for example, informational, economic, or regulatory instrument - can lead to a vastly improved distributional outcome. As such, for such instruments to be more than the sum of their parts, the distributive policy mix must be functionally diverse and synergistically designed [19].

In practice, many national governments only modify existing social welfare policies and argue that this constitutes an effort to protect vulnerable groups. This approach is ineffective as the transition to a low-carbon economy can create many unpredictable changes that social security, pension, and insurance were not designed to cover [21]. Therefore, distributive measures must exist in parallel to and complement existing social welfare policies.

5. Coding agenda

The practice of qualitative coding is employed to evaluate the extent of climate justice representation in the green transformation policy framework. Coding in the social sciences refers to the assignment of a concise label (a "code") to a portion of language-based or visual data, for instance, written texts, interview transcripts, or photographs, to summarize and evoke its essential attributes [23]. Different codes within the same unit of

analysis can be converted into quantifiable variables for correlational and causal analysis, or they can remain descriptive if the value of the variable itself is of interest to the researcher - which is the case in this research project.

The process of coding revolves around a coding agenda (or codebook), which identifies the variables, indicators of such variables, different values/ranks of such variables, and coding rules that allow the researchers to arrive at the values of variables based on the content of the indicators [9]. As qualitative research lacks the measurement rigor of the quantitative approach, a transparent coding agenda is vital to ensuring its credibility and replicability. Because there can be different accounts of a single aspect of social reality, a qualitative study must enhance its credibility by employing established scientific practices. Credibility thus has strong parallels with the principle of internal validity in quantitative research [24]. In the coding agenda of this project, such practices include the construction of indicators based on a thorough examination of the relevant literature, and the division of the three climate justice dimensions into qualitative ordinal ranks. Detailed coding rules also allow other researchers to repeat the analysis and arrive at essentially the same findings, boosting the replicability of the project. This not only confirms the accuracy of the findings but also lays the groundwork for future works that build on the current research project [24].

In this research project, each dimension of climate justice is treated as an ordinal variable, divided into four ranks. In ascending order of climate justice representation, these ranks are respectively: weak, fairly weak, fairly strong, and strong. The value of each variable is determined based on three indicators, synthesized from insights of the climate justice and governance literature (already discussed in the preceding section). An encoding rule is given in Table 1 - alongside a summary of other components of the coding agenda - to explain how these indicators are used to assess the value of each climate justice dimension/variable.

5.1. Recognition justice

Recognition justice is evaluated based on three indicators: a) formal acknowledgement of the harmful impacts of climate change as a natural phenomenon; b) formal acknowledgement of the harmful impacts of

Table 1. Coding agenda for the three dimensions of climate justice.

Variable	Indicators	Value	Definition	Encoding rule
Recognition justice	a) Acknowledgement of the adverse impacts of climate change as a natural phenomenon; b) Acknowledgement of the adverse impacts of measures to mitigate climate change; c) Identification of particularly vulnerable communities.	Strong	Acknowledgement of different forms of climate injustice and identification of particularly vulnerable communities.	All three indicators are present.
		Fairly strong	Climate change injustice is acknowledged as both a natural and man-made process. or The natural climate change injustice is acknowledged and particularly vulnerable communities are identified.	Indicators a) and b) are present. or Indicators a) and c) are present.
		Fairly weak	Only the natural impact of climate change is recognized as causing injustice to vulnerable groups.	Only indicator a) is present.
		Weak	Injustice caused by climate change is not acknowledged at all by the policy document.	No indicators are present.
Procedural justice	a) Stipulation of passive participation methods; b) Stipulation of active participation methods; c) Identification of communities whose participation shall be prioritized.	Strong	Strong conditions to promote popular participation along with clear beneficiaries.	All three indicators are present.
		Fairly strong	Active forms of popular participation are stipulated. or Only passive forms of popular participation are stipulated but with clear identification of communities to be empowered.	Indicators a) and b) are present. or Indicators a) and c) are present.
		Fairly weak	Only passive, consultative forms of popular participation are stipulated.	Only indicator a) is present.
		Weak	Empowering popular participation in mitigation policy planning and implementation is not a concern of the policy.	No indicators are present.
Distributive justice	a) Stipulation of measures to alleviate the burden of mitigation policies on vulnerable groups; b) Diversity of such distributive measures; c) Complementarity of such distributive measures with existing social welfare policies.	Strong	Distributive measures are diverse and complementary with existing social welfare policies.	All three indicators are present.
		Fairly strong	Distributive measures are diverse or complementary with existing social welfare policies.	Indicators a) and b) are present. or Indicators a) and c) are present.
		Fairly weak	There are some measures to fairly distribute the burden of mitigation measures, but limited to certain types of policy instruments.	Only indicator a) is present.
		Weak	Distributing the adverse impact of mitigation measures is not a concern of the policy.	No indicators are present.

climate change mitigation measures; c) identification of especially vulnerable communities. Accordingly, a policy is considered as “weak” in the recognition dimension if it does not recognize either the adverse impacts of climate change or mitigation efforts on vulnerable communities. If a document acknowledges the adverse impact of climate change as a natural phenomenon without addressing the potential burden placed on vulnerable groups by mitigation measures,

it is regarded as “fairly weak”. If, on top of recognizing the natural impact of climate change, a policy also identifies the vulnerable communities that will receive additional support but not the economic harm posed by mitigation efforts, it is considered “fairly strong”. This value also applies if the policy acknowledges both the burden of climate change and mitigation measures but without listing especially affected communities. Finally, if a policy contains a list of communities that

deserve special support and recognize the negative effect of both aspects of climate change, then its recognition justice dimension is regarded as “strong”.

5.2. Procedural justice

Three indicators are used to evaluate the strength of procedural justice in a policy: 1) Passive participation methods; 2) Active participation measures; 3) Identification of participating communities. Passive participation includes public consultation, feedback, and advisor panels, while active participation endows citizens with the right to design and implement all of parts of mitigation policies. Accordingly, a policy is considered “weak” on this dimension if there are no provisions for popular participation in either the development or implementation of mitigation measures. If participation is only passive, thus being limited to the solicitation of opinions, then the procedural dimension is considered “fairly weak”. If a policy provides for common citizens to advise, design, and implement mitigation measures without specifying which communities are eligible, then it is considered “fairly strong”. This rating is also applicable if the policy only stipulates passive participation methods but clearly establishes the identity of stakeholders. Finally, if a policy provides for active citizen involvement in policy design and implementation while also having a list of eligible participants, it is considered to have a “strong” procedural justice component.

5.3. Distributive justice

The strength of distributive justice is assessed based on the a) existence of measures to alleviate the burden of mitigation policies on vulnerable groups, b) diversity of such distributive measures, c) complementarity with existing social welfare policies. Accordingly, a “weak” rank is assigned if the policy contains no distributive measures or an intention to develop them in the foreseeable future. A “fairly weak” rank occurs when distributive measures are provided by a policy, but the diversity of the policy mix is too low. A “fairly strong” rating is given if the policy features different forms of policy instruments to support vulnerable groups such as information, financial, and capacity building measures. Finally, for a policy to be considered as having a “strong” distributive justice component, its distributive measures must be designed as a standalone policy package that complements traditional social welfare measures rather than replacing them.

6. Results

This section discusses the results of the analysis of the three dimensions of climate justice in the green transformation framework based on the coding agenda presented above. A summary of the findings and data sources is presented in Table 2.

Table 2. Findings on the three dimensions of climate justice in Vietnam’s green transformation policy framework.

Units of analysis	Variable	Coded value	Evidence for code
National Green Growth Strategy	Recognition justice	Very strong	Indicators a), b) [13]; Indicator c) [14]
	Procedural justice	Fairly strong	Indicators a), c) [14]
	Distributive justice	Fairly strong	Indicators a) [14] Indicator c) [14]
National Climate Change Strategy	Recognition justice	Fairly strong	Indicator a), c) [12]
	Procedural justice	Fairly strong	Indicators a), b) [12]
	Distributive justice	Fairly weak	Indicator a) [12]

6.1. Recognition justice

Regarding the Green Growth Strategy, the fourth objective stipulates improving the people’s resilience in the context of climate change, ensuring equality in accessing the fruits of economic development, and that no one is left behind [13]. To ensure the fulfilment of this objective, the people will be guaranteed equal access to social services such as jobs, healthcare, tourism, and information [13]. Regarding duty assignment, the Ministry of Labour, Invalids and Social Affairs is requested to develop social welfare policies to support vulnerable groups in the green transformation process [13]. This task is more concretely defined in Task Cluster 7 of the Green Growth Action Plan, which identifies vulnerable groups as being composed of: women, children, ethnic minorities, the poor, and the elderly. While the Strategy itself mostly focuses on identifying damages caused by climate change, the Green Growth Action Plan directly acknowledges that the economic transformation to combat climate change will lead to implications for vulnerable groups and stipulates specific measures to understand the impact and design remedial policies [14]. Therefore, it can be concluded that the recognition justice dimension of the Green Growth Strategy is strongly represented, thanks to the acknowledgement of the adverse impacts of climate change and climate change mitigation efforts, as well as the explicit recognition of increased rights for vulnerable groups.

The Climate Change Strategy determines that one of its five guiding visions is to “reduce vulnerability and increase resilience in the face of climate change impacts,” with the main beneficiaries being communities living in especially vulnerable areas. The strategy also calls for increasing the adaptive capability of the social system through disaster management, construction of green projects, and provisions of clean water, healthcare, and food. Groups earmarked for support include women, youths and adolescents, and people living in disaster-prone regions [12]. Although the adverse effects of climate change have been recognized and the identity of vulnerable groups is established, this is only limited to climate change adaptation. The strategy has not touched on the impacts of a comprehensive transformation towards decarbonized economic activities, despite having a very detailed section on mitigation targets, timeline, and responsibility assignment. Therefore, the recognition justice dimension of the Climate Change Strategy is rated as fairly strong.

6.2. Procedural justice

The Green Growth Strategy calls for the mobilization of all social components in achieving the green transformation, in particular, social organizations, non-governmental organizations, residential communities, and development partners. These entities are encouraged to participate in the implementation, supervision, and evaluation of the Green Growth Strategy in particular and the economic greening process in general [13]. For the Green Growth Action Plan, while social mobilization issues are not directly mentioned, they are still indirectly present in the form of Task Cluster 12 on agriculture and Task Cluster 13 on waste management. In particular, Task 12.5.2. regulates efforts to develop a new countryside on the principles of respecting the environment, traditional customs, and lifestyle of each region and ethnic group, while Task 13.1.3. encourages solid waste management initiatives that involve local citizens [14]. These tasks and solutions show that while the Green Growth Strategy has attempted to empower stakeholders, they are still limited to sectors that have a directly observable impact on daily lives. On the other hand, for sectors that have a profound impact on climate change and green transformation such as energy and transport, the named non-state actors are mostly trade associations and companies. Although the specific tasks have not covered all relevant sectors and the methods of stakeholder participation are not yet clarified, the procedural justice dimension of the

Green Growth Policy is still considered fairly strong as it has adequately identified the types of groups that deserve additional procedural privileges [14], creating a sound legal basis for future improvement.

The Climate Change Strategy calls for increased participation and contribution from women and youths in applying traditional knowledge in climate change adaptation and disaster management, while ensuring local people’s buy-in in developing sustainable forestry practices [12]. In particular, the reliance on local communities to formulate new mitigation and livelihood models is highly progressive and notable. This shows that the Climate Change Strategy has shown genuine efforts to support local communities on the basis of ethnic identity and regional customs, which are often at risk of disappearance in times of large-scale socio-economic transformation [25]. However, these regulations are only confined to climate change adaptation. Moreover, the identification of populations that are granted special procedural rights is limited to women, youths, and those who suffer directly from natural disasters, while many studies have shown that low-income people are most prone to climate change impacts, whether they live in cities or the countryside [26]. Therefore, the procedural justice dimension of the Climate Change Strategy is rated as fairly strong.

6.3. Distributive justice

There are two task clusters in the Green Growth Action Plan that are directly relevant to distributive justice issues, namely, Task Cluster 3 on green employment and Task Cluster 7 on ensuring equality in the green transformation. Specifically, Task Cluster 3 stipulates the development of a green job database and making it accessible to job-seekers. Task Cluster 7 has two missions: Mission 7.1. on researching the impact of the green transformation on vulnerable groups and developing policies to assist them, while Mission 7.2 calls for the integration of such policies with the three National Target Policies - including the Sustainable Poverty Alleviation Program, the New Countryside Development Program, and the Socio-economic Development Program for Ethnic Minority Areas.

A notable advantage of these provisions lies in the fact that new redistributive policies are added on top of existing social policies. This is a very progressive and effective approach that has been proven in other countries. However, the redistributive measures are not very diverse, being confined to capacity building and financial transfer. As such, the distributive justice dimension of the Green Growth Strategy is considered fairly strong.

Although the Climate Change Strategy stipulates numerous missions and targets in GHG reduction for various economic sectors, it has not clarified the impact on vulnerable groups. As discussed in the section on recognition justice, the Climate Change Strategy prioritizes the protection of people against extreme weather events instead of sharing the burden of climate change mitigation. As such, difficulties arising from the green transformation are only cursorily mentioned in the section about institutional reforms and public mobilization, particularly through the utilization of technologies such as blockchain and big data [12]. However, the strategy has yet to explain what these difficulties actually are, although it can be safely inferred that they stem from job losses caused by decarbonization of economic sectors. As such, the Climate Change Strategy is assessed as having a weak distributive justice dimension.

7. Recommendations to improve the three dimensions of climate justice in the green transformation framework

Regarding the dimension of recognition justice, the Climate Change Strategy has only recognized adverse impacts from climate change adaptation, while in practice the switch to a low-carbon development pathway entails numerous risks and uncertainties for vulnerable groups. Therefore, the Climate Change Strategy must recognize the possible harm caused by mitigation policies so as to create a basis to improve the other two justice dimensions. Moreover, this will also lead to consistency between the Climate Change Strategy and the Green Growth Strategy, helping to harmonize and integrate two cross-sectoral documents with many identical guidelines and objectives.

Regarding procedural justice, the Green Growth Strategy and Climate Change Strategy both emphasize the participation of stakeholders in the green transformation, identify vulnerable groups, and recognize the role of traditional culture in designing climate change response actions. However, both strategies have only incorporated procedural privileges into adaptation and disaster management aspects. In the future, the green transformation framework should create favourable conditions for individuals and local communities to raise opinions, design, and directly implement mitigation measures. Notably, initiatives that have been successfully piloted in local regions, such as energy efficiency contests, should be multiplied and given a focus on the participation of individuals and households as opposed to companies and organizations [27].

Regarding distributive justice, the Green Growth Strategy should expand its policy mix to cover more economic sectors. The types of assistance should also

be diversified, for example, by including the investment of green infrastructure. In addition, the Climate Change Strategy should consider integrating social sustainability factors into its objectives and missions on decarbonization of economic sectors to cement its status as the leading legal document in both climate change adaptation and mitigation in Vietnam. Furthermore, both strategies could benefit from research into how revenues from the carbon credit market, stipulated in the revised Law on Environmental Protection and piloted starting from 2025, can be used to invest in the aforementioned distributive measures.

8. Conclusions

In recent years, the Vietnamese government has exerted strong efforts to promote economic development, protect the environment, and fulfil international obligations. To guarantee the success of these ambitious goals, social sustainability principles must be respected and pursued. The climate justice conceptual framework, divided into three interconnected dimensions, is highly appropriate for this purpose.

This article is the first effort to assess the strength of the three climate justice dimensions in Vietnam's green transformation policy framework, which primarily covers the green growth and climate change mitigation fields. Despite relatively muted popular interest in the social sustainability dimension, the two major policies of the green transformation contain fairly detailed provisions for climate justice, covering the recognition, procedural, and distributive dimensions. This suggests that the drafting Ministries have taken an active interest in ensuring a just transition and conducted systematic research based on the international state of the art. This demonstrates a serious commitment from the Vietnamese government to achieve comprehensive sustainable development in all three pillars and contrasts sharply with the Western literature that predominantly depicts the country's environmental governance as driven by crony interests at the expense of common citizens [28].

The stark difference between the literature and the article's findings can be explained by two distinct hypotheses, which are also potential research directions. In the first scenario, Vietnam's environmental governance has actually always taken into account the social sustainability dimension, yet its implementation is watered down by bureaucratic enforcers. Therefore, future research should explain which factors have prevented the implementation of justice and equity provisions in ecological policies and what remedial measures can be proposed. In the second explanation, the Vietnamese government has undergone a paradigm shift in its conceptualization of the role of social sustainability vis-à-vis the economic and environmental

pillars. Prior to and including much of the 2010s, Vietnam's environmental-economic policy mix closely corresponded with the 'ecological modernization' school of thought, which argues that industrialization can lead to better environmental conditions but often disregards social concerns [29]. Starting in the late 2010s, Vietnam's official discourse has shifted to promoting equitable distribution of the fruits of development instead of a growth-at-all-cost mentality [30], which would be more compatible with climate justice. The research purpose of this direction will be to determine whether and why such a change has taken place and their implications for the country's sustainable development.

COMPETING INTERESTS

The author declares that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] World Bank Group (2020), *Climate Risk Country Profile: Vietnam*, 32pp.
- [2] J.A. Sathaye, A. Najam, C. Cocklin, et al. (2007), "Sustainable development and mitigation", *Climate Change 2007: Mitigation of Climate Change: Working Group III Contribution to The Fourth Assessment Report of The Intergovernmental Panel on Climate Change*, pp.691-743.
- [3] M. Lederer, L. Wallbott, F. Urban, et al. (2021), "Low-carbon energy, sustainable development, and justice: Towards a just energy transition for the society and the environment", *Sustainable Development*, **29**(6), pp.1049-1061, DOI: 10.1002/sd.2193.
- [4] S. Caney (2013), "Two kinds of climate justice: Avoiding harm and sharing burdens", *Journal of Political Philosophy*, **21**(4), pp.125-149, DOI: 10.1111/jopp.12030.
- [5] A.L. Bristow, M. Wardman, A.M. Zanni, et al. (2010), "Public acceptability of personal carbon trading and carbon tax", *Ecological Economics*, **69**(9), pp.1824-1837, DOI: 10.1016/j.ecolecon.2010.04.021.
- [6] M. Buchs, N. Bardsley, S. Duwe (2011), "Who bears the brunt? Distributional effects of climate change mitigation policies", *Critical Social Policy*, **31**(2), DOI: 10.1177/0261018310396036.
- [7] T. Vo (2021), "Prime Minister calls for 'equity and climate justice' at COP26", *VnExpress*, <https://vnexpress.net/thu-tuong-keu-goi-cong-bang-cong-ly-khi-hau-tai-cop26-4380072.html>, accessed 1 November 2021 (in Vietnamese).
- [8] R.K. Yin (2003), *Case Study Research: Design and Methods*, Sage Publications, 181pp.
- [9] P. Mayring (2000), "Qualitative content analysis", *Forum: Qualitative Social Research*, **1**(2), DOI: 10.17169/fqs-1.2.1089.
- [10] T. Ha (2022), "The international community accompanies Vietnam in green transformation and sustainable development", *Vietnam Government Portal*, <https://baochinhphu.vn/quoc-te-dong-hanh-cung-viet-nam-trong-chuyen-doi-xanh-phat-trien-ben-vung-10222060309222338.htm>, accessed 3 June 2022 (in Vietnamese).
- [11] D.N. Anh, F. Urban, G. Siciliano, et al. (2018), "Green transformations in Vietnam's energy sector", *Asia and The Pacific Policy Studies*, **5**(3), pp.558-582, DOI: 10.1002/app5.251.
- [12] Prime Minister of the Government (2022a), *Decision 896-QĐ-TTg on Approving The National Climate Change Strategy for The Period up to 2050* (in Vietnamese).
- [13] Prime Minister of the Government (2021), *Decision 1658-QĐ-TTg on Approving The National Green Growth Strategy for The Period 2021-2030, Vision Towards 2050* (in Vietnamese).
- [14] Prime Minister of the Government (2022b), *Decision 882-QĐ-TTg on Approving The National Green Growth Action Plan for The Period 2021-2030* (in Vietnamese).
- [15] S. Caney (2020), "Climate justice", *Stanford Encyclopedia of Philosophy*, <https://plato.stanford.edu/entries/justice-climate/>, accessed 3 June 2022.
- [16] H. Bulkeley, G.A.S. Edwards, S. Fuller (2014), "Contesting climate justice in the city: Examining politics and practice in urban climate change experiments", *Global Environmental Change*, **25**, DOI: 10.1016/j.gloenvcha.2014.01.009.
- [17] I. Preston, N. Banks, K. Hargreaves, et al. (2014), *Climate Change and Social Justice: An Evidence Review*, Report of Joseph Rowntree Foundation, 82pp.
- [18] J. Pretty (1995), "Participatory learning for sustainable agriculture", *World Development*, **23**(8), pp.1247-1263, DOI: 10.1016/0305-750X(95)00046-F.
- [19] S. Williams, A. Doyon (2019), "Justice in energy transitions", *Environmental Innovations and Societal Transitions*, **31**, pp.144-153, DOI: 10.1016/j.eist.2018.12.001.
- [20] A. Silveira, P. Pritchard (2016), "Justice in the transition to a low carbon economy", *Cambridge Institute for Sustainability Leadership*, DOI:10.13140/RG.2.1.4933.2727.
- [21] G. Zachmann, G. Fredriksson, G. Claeys (2018), "The distributional effects of climate policies", https://www.bruegel.org/sites/default/files/wp-content/uploads/2018/11/Bruegel_Blueprint_28_final1.pdf, accessed 1 July 2022.
- [22] S. Juhola, M. Heikkinen, T. Pietilä, et al. (2022), *Connecting Climate Justice and Adaptation Planning: An Adaptation Justice Index*, *Environmental Science and Policy*, **136**, pp.609-619, DOI: 10.1016/j.envsci.2022.07.024.
- [23] J. Saldana (2009), *The Coding Manual for Qualitative Researchers*, Second Edition, SAGE Publications, 440pp.
- [24] A. Bryman (2022), *Social Research Methods*, 4th edition, Oxford University Press, 750pp.
- [25] O. Serdeczny, E. Waters, S. Chan (2016), "Non-economic loss and damage in the context of climate change understanding the challenges", *German Development Institute*, https://www.idos-research.de/uploads/media/DP_3.2016.pdf, accessed 3 June 2022.
- [26] B. Levy, J. Patz (2015), "Climate change, human rights, and social justice", *Annals of Global Health*, **81**(3), pp.310-322, DOI: 10.1016/j.aogh.2015.08.008.
- [27] Vietnam Electricity (2021), <https://tietkiemnangluong.evn.com.vn/d6/news/-Suc-lan-toa-cua-phong-trao-thi-dua-tiet-kiem-dien-111-135-14237.aspx>, accessed 11 January 2021 (in Vietnamese).
- [28] S. Ortmann (2017), *Environmental Governance in Vietnam: Institutional Reforms and Failures*, Palgrave Macmillan, 327pp.
- [29] A. Mol (2003), *Globalization and Environmental Reform The Ecological Modernization of The Global Economy*, The MIT Press, 288pp.
- [30] Party Central Committee of the Communist Party of Vietnam (2016), *Resolution No.5-NQ/TW, The Fourth Plenum of The 12th Party Central Committee on a Number of Orientations and Major Policies to Continue The Growth Model Innovation and Improve The Quality of Growth, Labour Productivity Competitiveness of The Economy* (in Vietnamese).

Overview of gender mainstreaming in agriculture and rural development in Vietnam

Nguyen Huu Nhuan^{1*}, Nguyen Thi Thu Huyen¹, Ngo Thi Khanh Ly²

¹Vietnam National University of Agriculture, Trau Quy Town, Gia Lam District, Hanoi, Vietnam

²Vietnam Partnership of Human Resource Development for Rural Areas,

4th Floor, A1 Building, 102 Truong Chinh Street, Phuong Mai Ward, Dong Da District, Hanoi, Vietnam

Received 18 November 2022; revised 30 January 2023; accepted 14 February 2023

Abstract:

Gender issues and gender inequality still exist in many countries, especially in remote and poor rural areas. Rural women often suffer from economic disadvantages, low self-confidence in the family and community, and limited access to health, social services, and extension services, which leads to lesser decision-making roles in the production and business of households and in leadership at work. In the context of digital transformation, women were found to be more disadvantaged in comparison with men. Gender mainstreaming activities have only recently become apparent in development efforts but are still limited in development projects. Promoting gender mainstreaming in rural development activities will be necessary to improve the capacity of women towards achieving rural development. Future interventions should pay more attention to building the capacity for women to access more educational and extension services in enabling environments. Institutional monitoring system to track progress in gender mainstreaming in agriculture and rural development will be very important to deliver wider impacts of development programs and projects.

Keywords: agriculture, gender mainstreaming, rural development, Vietnam.

Classification numbers: 4.1, 7

1. Introduction

Vietnam is an agricultural country with large export markets around the world. Agriculture transformation has contributed to poverty reduction in rural areas, which is reflected by increased income from non-crop cultivation, especially among ethnic minorities. In recent years there has been a great shift in the workforce from agricultural to non-agricultural sectors, specifically from about 65% in 2000 to 47.4% in 2012, 39.4% in 2019 [1] and 29.06% in 2021 [2]. The total population in 2021 of the country is approximately 98.5 million people of which about 61.9% live in rural areas. The percentage of female population in 2021 was nearly 50.2 %. The growth rate of gross domestic product (GDP) in the period 2016-2021 was quite high, at an average of about 8.5%. The agriculture, forestry, and fishing sectors contributed about 12.6% to Vietnam's GDP in 2021 [2].

In 2017, the ASEAN Ministers on Agriculture and Forestry (AMAF) agreed to develop the ASEAN Guidelines on Promoting Responsible Investment (RAI) in Food, Agriculture, and Forestry. Within these ASEAN guidelines, gender mainstreaming has been included. In 2020, the Food and Agriculture Organization of the United Nations (FAO) and the Asia Partnership for the Development of Human Resources in Rural Areas (AsiaDHRRA) advocated for the adoption of frameworks such as the globally recognised principles of the FAO's Committee on World Food Security (CFS) for Responsible Investment in Agriculture and Food Systems (CFS RAI) and supported the rollout of the ASEAN Guidelines to Promote RAI [3]. Responsible investment entails respect for gender equality, age, and non-discrimination and requires reliable, coherent, and transparent laws and regulations. It is therefore important to understand how far gender

*Corresponding author: Email: nhnhuan@vnua.edu.vn

mainstreaming practices have reached in the context of smallholder farmers and rural communities in Vietnam.

Achieving gender equality has been one of the prime concerns of Vietnam. Resolution No.26-NQ/TW of the Communist Party of Vietnam on agriculture, rural areas, and farmers is the foundation for the new rural development, which sets the targets for agriculture and rural development by 2020 and details eight main solutions. Resolution 26-NQ/TW also sets targets for women's representation by 2030 for Party Committees at all levels (25%), and for National Assembly and People's Councils at all levels (35%). The country's gender equality strategy 2021-2030 targets that 60% of state agencies and local governments must have women in key leadership positions by 2025, which should rise to 75% by 2030 [4]. Thanks to great efforts over the past few decades, Vietnam has made great achievements in gender equality. The country has been recognised as one of the top 10 best performers worldwide in implementing the United Nations' goal No.5 on achieving gender equality and empowering all women and girls. Vietnam scores 0.705 on a scale from 0 to 1 in terms of the gender gap index, ranking 83 out of 146 countries, improving its position from 87 in 2021 [5].

Despite these successes, gender inequality is still persistent in rural areas, especially in poor districts and communes. There are still gender gaps in terms of labour, employment, property ownership, and access to essential services in rural and poor districts, communes, and regions. Gender-based violence remains a widespread and worrisome issue. There have been several gender issues found in Vietnam in general [6, 7]. Those issues have been more serious in minority ethnic groups compared to the majority group - the Kinh ethnic group. Gaps in education, training, employment, income, healthcare, and reproduction have also been found among ethnic minority groups in both rural and urban regions.

This article aims to generate an understanding of gender policies, programs, and services, as well as their successes and shortcomings, and how to interact with or promote inclusive rural development. Identifying national platforms that effectively

work around gender and women empowerment in the agricultural sector and rural areas is also an important part of this article. These ideas help the formulation of development strategies and provide concrete recommendations on national and regional gender mainstreaming works towards sustainable development.

2. Methodology and data

This analysis employed a documentary research method for collecting and reviewing available secondary documents. A systematic review of published literature was conducted to collect data on gender mainstream for rural development in Vietnam. Scientific databases like the Web of Science and the Agricultural Science and Technology Information (AGRIS) were searched using the following keywords: gender, agriculture, rural development, and Vietnam. Vietnamese databases including the Vietnamese Science and Technology database (STD), the Journal of Agriculture and Rural Development, and the National Library of Vietnam were also searched for relevant publications using the same keywords in Vietnamese (gender - *giới*, agriculture - *nông nghiệp*, rural development - *phát triển nông thôn*). The review included studies published in both Vietnamese and English language. More than 50 documents were downloaded and reviewed in the first stage. Upon compilation of search results from different databases, duplicate records were removed. Thereafter, the titles and abstracts of the articles were screened for relevance. Finally, 19 full-text records related to gender and women empowerment in agriculture and rural development in Vietnam were evaluated and synthesised for the review.

In addition, primary data was gathered through key informant interviews (KIIs) and focus group discussions (FGDs) with leaders and researchers from the Vietnam Women's Union (VNFU), Ministry of Agriculture and Rural Development (MARD), and several research institutions. Participants were selected on the advice of senior experts in gender mainstreaming and representatives from the Vietnam Women's Union (Table 1). This aimed to generate an understanding of gender issues and gender mainstreaming policies in agriculture and rural areas of Vietnam to recommend development policies.

Table 1. The number of FGDs and KIs.

Participants	FGD		KIs		Total
	Men	Women	Men	Women	
1 At the central level (Vietnam Women's Union, Vietnam National University of Agriculture, Vietnam Women's Academy, National Research institutes in Agricultural fields)	2	4	4	2	12
2 At the district level (staffs of Department of Agriculture and Rural Development (DARDs), Women Unions, and Farmer's Union) in Ly Nhan district (Ha Nam province); Nho Quan district (Ninh Binh province), Ba Vi District (Hanoi)	2	5	-	-	7
3 International development agencies and non-governmental organizations (NGOs)	1		1	5	7
Total	5	9	5	7	26

3. Results and discussion

3.1. Gender issues in agriculture and rural development

3.1.1. Gender issues in obtaining job opportunities and income between males and females and among different ethnic groups

Inequalities of job opportunities and income between men and women in the same position exist today [8]. The opportunity for women to access high-income jobs is still lower than that of men. Consequently, the average income of female workers is often lower than the average income of male workers [9]. M. Wells (2005) [10] pointed out that female-headed households (divorced, separated, or widowed women) in Vietnam, particularly in rural areas, are more vulnerable to poverty. A report by International Labour Organization (ILO) in 2021 [11] also indicated that COVID-19 created new inequalities for women as they left the labour market in larger shares than men. Indeed, a gender-based gap appeared in the unemployment rate. According to the General Statistics Office of Vietnam (GSO) (2021) [12], in 2019, women's access to jobs and job security were lower than their male counterparts. Statistics show that only 43% of employed women are wage workers compared with 51.4% of employed men. Meanwhile, unpaid family labour for women is 19.4% which doubles the figure (9.2%) for men's labour.

In comparison to other demographic groups, ethnic minority groups had the lowest proportion of their workforce in professional, skilled employment and the largest share in unskilled employment. There were around 6.53 and 5.69% of skilled workers aged 15 and older for males and females, respectively. Female ethnic minority workers aged 35 and older could not participate in vocational training courses because of high illiteracy and returning to illiteracy rates in the Vietnamese language. Ethnic minority women engage in the labour force much earlier than women in the Kinh ethnic group. By the age of 15, many ethnic girls have joined full-time work. Most of their workers are self-employed in agriculture. They have limited opportunities to access paid jobs [11].

3.1.2. Gender issues in education and training between males and females and among different ethnic groups

According to the Committee for Ethnic Minority Affairs (2019) [13], women and girls often participate in short-term and traditional vocational training. The ratio of women attaining postgraduate education is also much lower than that of men. This will lead to occupations that offer low incomes or sectors where jobs are more difficult to find. H.T. Hoa, et al. (2020) [8] also point out that education level is one of the driving factors affecting the income gap between men and women in Vietnam.

About differences among ethnic groups, there has been a gap in access to quality education between children in ethnic minority groups and those of the Kinh ethnic group. This gap is wider in higher-level education. For example, the percentage of children going to school at the primary level of the Kinh group was 89.21%, while this number for ethnic minority groups was 88.83%. However, those numbers at the upper secondary school level were 65.2 and 32.33%, respectively. According to P.L. Nguyen, et al. (2020) [14], unequal access to education services and variations in the quality of education not only exist between majority and minority ethnic communities, but also between disadvantaged areas (i.e., remote, mountainous, and rural areas) and urban areas.

The infrastructure of schools at the lower secondary level is inadequate and insecure for ethnic minorities. This indicates a potential danger for ethnic minority children, especially girls. M. Wells (2005) [10] also indicated that better education provisions are necessary for female ethnic minorities of certain groups such as Nung, Muong and Tay.

3.1.3. Gender issues in healthcare among different ethnic groups

There is a disproportionate quality of health care services among different ethnic groups in Vietnam as discussed by the Committee for Ethnic Minority Affairs (2019) [13]. In 2002, infant and child mortality rates in the ethnic minorities located around the northern mountain region were twice the rates of those of the majority Kinh near the Red river delta [10]. The maternal mortality rate in some ethnic minorities such as Hmong, Thai, Ba Na, Tay, Dao, and Nung remains even higher. Indeed, the maternal mortality rate was estimated to be four times higher compared to that of the Kinh ethnic group [13].

Ethnic minority women often give birth for the first time at a much younger age than Kinh women. Their health during pregnancy is also inferior to that of Kinh women. The percentage of pregnant ethnic minority women aged 12-29 receiving prenatal check-ups at medical clinics/stations was 70.9%, while this number for Kinh women aged 15-49 was 99%. In 2015, there were still about 36.3% of ethnic minority women giving birth at home compared to just 0.5% of Kinh women. For some ethnic groups such as La Hu, Si La, La Ha, Mang, Ha Nhi, and Cong, the percentage of women giving birth in medical clinics was less than 20% due to the limitation of road access, poverty, and traditional customs and practices as well. Similarly, the percentage of ethnic minority women receiving postnatal care for two days was also low (at around 64%) [13].

Generally, ethnic minority children do not receive sufficient health care and priority for nutritional content. There are some reasons leading to poor health care for ethnic minorities including: (i) the limitations and constraints of the health care system in geographically and economically isolated areas; (ii) language and cultural barriers; (iii) poverty; and (iv) preference to be examined by a female health worker.

3.1.4. Early marriage

In Vietnam, the prohibition of early marriage was presented in the *Law on Marriage and Family* (2014) [15]. However, the results from the 2015 survey indicated that the average rate of early marriage was 26.6% (26% for males and 27.1% for females). The O Du ethnic group had the highest rate with 73%. In comparison to urban areas, early marriages in rural regions are far more common. About gender, in some ethnic minority groups, girls are up to 3.4 times more likely to be married as children than boys. A child is defined as a person under 16 years of age [16].

A central factor leading to early marriage is that it is considered a means of securing livelihoods. In some cases, girls decide to marry early due to concerns about remaining single and the decreasing likelihood of getting married later on. Improvement in accessing information technology, smartphones, and social networks has also been reported to have an impact on early marriage. Established traditions are another reason in the context of Vietnam. In addition, insufficient effectiveness of legislative prohibition is also considered a cause of child marriage.

3.1.5. Domestic violence

Domestic violence is regarded as a critical issue in Vietnam. M. Wells (2005) [10] reported an enduring gender challenge in Vietnam, namely, violence against women. Domestic violence occurs in both rural and urban areas, with most victims being women and children. However, similar to other gender issues, domestic violence is also more widespread in ethnic minority households than that in Kinh ethnic households. About 35% of ethnic minority women have experienced physical and/or sexual violence [17]. According to a study funded by the United Nations Population Fund (UNFPA) and Australia's Department of Foreign Affairs and Trade (DFAT) in 2019, about 63% of married Vietnamese women experienced one or more forms of physical, sexual, emotional, or economic violence and controlling behaviour by their husbands in their lifetime [18].

3.1.6. Gender issues in unpaid housework

The burden of unpaid work facing women is an issue in Vietnam in general. However, this is more severe in ethnic minority areas due to a lack of electricity and clean water, poor road conditions, and isolation from markets, schools, medical clinics, etc. On average, about 74% of ethnic minority women and 5% of ethnic minority girls are regularly in charge of collecting clean water for households. In some areas, they have to travel for more than 30 minutes to collect clean water. Moreover, several ethnic minority communities are matrilineal. In those communities, the women are the heads of households and are responsible for earning income.

The division of domestic labour within a family is strongly influenced by gender norms, stereotypes, and prejudices. In Vietnam, domestic work and taking care of children, older family members, and the ill are assumed to be the responsibility and duties of women. In addition, the lack of a social care system for the elderly increases the burden of care for female family members. A report by the ILO (2021) [11] also mentioned that while being highly economically active, women are also in charge

of a disproportionate amount of family responsibilities. Women spend twice as many hours as men producing services for their households. The work includes cleaning, cooking, and taking care of family members and children.

Besides, gender issues have been reported in social protection, leadership, management, and women's invisibility in fishery sectors [13, 19]. According to the Committee for Ethnic Minority Affairs (2019) [13], the rate of women participating in leadership and management is low in every agency within the political system on both national and provincial levels. Women have rarely been the head of an agency that can take up strategy and make decisions. Moreover, ethnic minority women participating in politics remains low, not only in comparison to that of men, but also to women from the Kinh ethnic group.

C. Pross, et al. (2020) [19] indicated that in Asia in general and Vietnam in particular, inequalities related to gendered fishery practices have been under-valued economically and side lined within policymaking. The reason is that women are often responsible for activities such as shellfish gleaning, cleaning, fish processing, and trading and those activities are commonly considered extensions of domestic work rather than productive labour.

3.2. Gender mainstreaming actions in agriculture and rural development

3.2.1. At a national level

At a national level, there have been several pieces of evidence showing that the Vietnamese government has implemented gender mainstreaming actions. The results of this study show that a relatively progressive legal framework at the national level on gender equality and the empowerment of women has been developed including policies to promote gender equality in ethnic minority areas. In the *Law on Gender Equality* (2006) [20], specific provisions aimed at promoting gender equality in ethnic minority areas are incorporated. Besides, the Vietnamese government also established a national strategy for gender equality and this strategy was detailed in two programs over the two periods 2011-2015 and 2016-2020.

Moreover, since 2015, there have been two national projects to end child and inter-family marriage in ethnic minority regions and support gender equality activities. In addition, Vietnam has increased its efforts to implement surveys and studies to generate data and practical evidence for policymaking and to inform the policies of statutory bodies responsible for gender equality in ethnic minority areas. For instance, the first survey in 2015 conducted by the GSO reported that gender issues in Vietnamese minority regions are more severe in ethnic minority groups than in the Kinh ethnic group and those issues must be addressed and overcome. Women and girls are more disadvantaged in

terms of access to opportunities and resources due to social norms. The position of women tends to be as inferior to men. Social norms also restrict women's livelihood options and often limit them to domestic and reproductive activities.

3.2.2. At a sectoral level

At a sectoral level, we also found evidence of gender mainstreaming actions in some fields. Agriculture is the sector most affected by climate change in Vietnam and women are often more impacted because they make up the majority of the labour force. The gender division of labour in each sector and the additional responsibilities that women have to assume due to gender norms often limit their active participation in decision-making within and outside the household. Women in rural areas have government-facilitated access to preferential credit, but there is currently no information highlighting the link of this program to women's climate change vulnerability or exposure to climate risk. In rural areas, women need access to new technologies to diversify their livelihoods and proactively respond to the impacts of climate change.

Water security issues due to climate change often have a more severe impact on women, especially poor women. Because of the traditional role in the family, women are often the main source of water. That has limited their opportunities to contact and participate in social, educational, and economic activities. Although women play an important role in ensuring a domestic water supply for their families, in many national policies related to water resources and gender, women are considered one of many vulnerable groups.

A report by N. Menon, et al. (2016) [21] reported that, on balance, land-use rights held exclusively by women or jointly by couples result in several beneficial effects including increased household expenditures and women's self-employment, as well as lower household vulnerability to poverty.

A study conducted by T.T.K. Van, et al. (2018) [7] explored gender differences in formal credit approaches to rural households in Vietnam. The results showed that women in Vietnam have less access to formal credit than men. In addition, many rural women in mountainous and remote areas are illiterate, leading to immense difficulty in obtaining credit for production and business. Men tend to have more advantages in accessing credit for investments and training on using the loan for household economic development.

D.N. Quoc, et al. (2019) [6] argued that in the context of the transition economy in Vietnam, empowerment for Vietnamese women has been far from achieving gender equality. They provided evidence to convince that empowerment for women has created more burden

for them and they had to shoulder two roles of both paid labour and unpaid caregiver. Hence, there should be a continuation of a holistic gender strategy. This is very true to work in agricultural and rural areas in Vietnam, and other developing countries as well, if limited efforts are made to create more equal work and home responsibilities between men and women.

3.2.3. At development projects and private sector

Gender equality and equity has been integrated into most development projects and programs implemented by international development agencies and NGOs in partnership with local authorities and communities throughout Vietnam, especially in rural areas [22, 23]. Almost all NGOs and development projects funded by international development agencies have activities to mainstream gender and empower youth and women. All NGOs are concerned with gender differences (but with different priorities) in the process of project implementation (data collection, design of interventions...) [24]. This enhances the participation of women as well as contributes to the sustainability of the project's achievements.

The gender lens has been applied in many internationally funded development projects, especially agricultural product value chain projects. When applying the gender lens to those projects, insights into time trade-offs for the production process between males and females are expected. Based on those insights, interventions can be designed accordingly in an appropriate way. For instance, a gender lens has been applied to the project "Market-based approaches to improving the safety of pork in Vietnam" (2017-2022) funded by ACIAR to understand the role of males and females in the pork value chain in Vietnam, especially in slaughtering and retailing activities. For slaughterhouses, women were often responsible for preparing boiled water and cleaning after slaughtering and men were often responsible for slaughtering and cutting the carcass. Most of the retailers were female. Consequently, when organizing training to improve awareness and practices of those stakeholders to improve food safety, gender issues were considered carefully (FGDs and KIIs). Similarly, a paper by R.H. Bosma, et al. (2018) [25] also gave evidence of applying a gender lens in the aquaculture value chain in Vietnam.

Action Aids Vietnam has also implemented various programs, projects, and activities on agriculture and rural development focusing on livelihood support and capacity-building training for the community in agricultural techniques to support animals, plants, and climate change adaptation livelihood plans. Much attention has been paid to gender mainstreaming in almost all projects and programs of Action Aids Vietnam. In addition, projects on building community capacity in community development

management, nutritional health, child protection, and supporting communities to recover from the COVID-19 pandemic and disaster prevention have been also accomplished by many NGOs in Vietnam.

3.3. National platforms for gender

The Vietnamese Government is strongly committed to gender equality, as reflected in several national laws, its ratification of key international conventions such as the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW) in 1982, and various policies supporting socio-economic development plans.

Thanks to many efforts by the Vietnamese Government, international development agencies, and NGOs, there has been a drastic change in awareness and promotion of societal changes in behaviour to implement gender equality, gradually narrowing the gender gap and partly raising the status of women in rural and agricultural areas. Communication on gender equality and domestic violence has also been integrated into development projects and programs leading to the initiations of positive changes in gender equality and equity, especially in remote and mountainous regions.

The Vietnam Women's Union has a broad nationwide network composed of four levels: the central level; the provincial/municipal and equivalent level (called provincial level); the district/precinct/provincial capital and equivalent level (called district level); and the commune/ward and equivalent level (called grassroots level). The highest body of the Vietnam Women's Union is the National Women's Congress. The Vietnam Women's Union has implemented many programs and projects to support rural women to develop their economy through production and agribusiness and has contributed to many activities in rural development. These organizations for Vietnamese women show strong systems from the central to local level by implementing development activities including agricultural and rural development programs.

Although there are many programs related to rural planning development or gender issues with attention to the participation of women and young people, there are limited large-scale projects or specific programs on RAI for youth or young women. Despite empowering women more, in reality, Vietnam still has a low rate of women in leadership and management roles.

There have been some incentive works for women such as women who are good at domestic chores, women's unions, emulation programs for women on special occasions, and dedicated rewards for good women but there have been no large scale and comprehensive incentive policies and programs. To some extent, women are sometimes given more jobs rather than being empowered.

Box 1. Women participation in leadership

“Although Vietnam is very interested and gives priority to issues of gender equality, especially women’s empowerment. Moreover, women face more difficulties because they do not have enough knowledge and experience and are not capable enough to shoulder many important responsibilities such as taking care of the family and participating in social activities, politics or decision-making rights in family farming. For example, the Vietnam Women’s Union at the Central Office has 16 departments, but only 2 units have women playing a key role in the head of a department.”

Source: Interview with a leader from the Vietnam Farmer Union, Oct 2021

Many women are not willing to participate in development or project activities, especially in rural and remote areas.

The importance of gender mainstreaming has not been properly made aware to the public as an important responsibility and factor to increase the effectiveness of programs and projects. In practice, gender mainstreaming has not yet become a mandatory condition when approving domestic programs and projects. Hence, for many programs and projects, gender mainstreaming is only assessed through the number of women participating in activities without other measures to promote gender equality such as the design of activities with gender sensitivity. In addition, the necessary budget for gender mainstreaming has not been ensured to promote gender equality activities in programs and projects.

3.4. Challenges to implementing gender mainstreaming

There are several challenges to implementing gender mainstreaming in Vietnam. Along with the existence of gender inequality, rural women suffer from economic disadvantage, lack of power and confidence in the family and community, and face many difficulties in accessing health, social services, and resources. In addition, women have a lesser role in making decisions on the type of crops, and female household heads in the particular face more challenges than men in accessing technical knowledge and better working conditions.

NGO projects have very specific gender equality assessment criteria; while state projects normally do not have specific criteria, the implementation depends on many factors such as qualifications, the approach of implementing staff and local culture, and women’s capacity.

Along with the process of international integration, digital transformation helps women expand their opportunities to access information, improve their capacity and professional qualifications, seek career development opportunities, cultivate training knowledge to develop themselves and increase opportunities to participate in management leadership positions. However, digital transformation also poses many challenges, especially for women in rural or remote areas. Women are still disadvantaged, especially in issues related to digital transformation. The results from FGD in this study reveals that when a project is invested, it creates a gap between men and women in digital transformation activities because smartphone users are mainly men while women are the main workers, creating some communication difficulties. Training activities that require the application of technological advances are often more difficult for women than men.

Box 2. Gender mainstreaming in implementation of projects and programs

“NGOs’ projects recently often have a specific gender component and gender equality assessment criteria, whereas state’s projects have neither a gender component nor gender equality assessment criteria. Therefore, the integration of gender mainstreaming when implementing state projects depends on many factors such as qualifications and approach of implementing staff and local culture.”

Source: FGD, Oct 2021

While women can be more empowered and do well in assigned tasks, they face more disadvantages than men because, in addition to social work, they also have to pay more attention to other jobs such as taking care of the family.

At the district level, finding from FGDs with district staff and leaders in agriculture and mass organizations such as women’s and farmer’s unions show that the awareness of local stakeholders on responsible agricultural investment (RAI) with a focus on gender mainstreaming is still limited. It has been also shared by the district staff of the Ba Vi district (Hanoi), Ly Nhan district (Ha Nam province), and Nho Quan district (Ninh Binh province) that many agricultural extension training activities have been organised for farmers by local government extension stations, but little attention has been made to gender issues.

3.5. Proposed actions for gender mainstreaming

Based on the above findings, some actions should be carried out to promote gender mainstreaming in agriculture: i) focusing on improving women's access to education and legal services; ii) building extension capacity to provide gender-sensitive supports and market-driven productions; iii) facilitating partnerships and networks amongst civil

society organizations (CSOs), farmers' groups, indigenous peoples' groups, and women's cooperatives to support women's economic empowerment; iv) enhancing roles of mass organizations and civil society in promoting gender mainstreaming; and v) setting up institutional monitoring systems to track progress in gender mainstreaming in agriculture. These are expanded on in Table 2.

Table 2. Summary of the proposed actions for gender mainstreaming.

Focus	Action for development
Improve women's access to education and legal redress mechanisms and women's ability to collectively mobilise and claim political rights.	Conducting regular gender analyses to provide information to support the process of establishing or adjusting programs/policies; Mobilising women's participation in community activities, including agricultural production; Raising awareness about gender equality: The status of "respecting men, disregarding women" is still a major ideological consequence. This will not only affect the rights of women but also limit the development of society. Both men and women need to update their awareness and eliminate gender discrimination stereotypes. Training and talks on gender equality on television and radio... should be organised regularly. Integrating gender equality work into socio-economic development programs at different levels. Violations and gender discrimination should be strictly handled; Strengthening opportunities for disadvantaged ethnic minority women to access and benefit from policies and services for vocational training; Strengthening support policies for ethnic minority areas and market connectivity, climate-adaptive production, and safe agricultural production. Changing awareness, habits, and behaviour of a person or a community requires a process or approach starting from the smallest and simplest things, especially in culturally diverse and remote regions; Strengthening and propagating the roles of women in the family through books, newspapers, television and radio... to mobilise women's potential for agricultural, forestry, and fishery development; Gradually removing the view of women as a vulnerable group when establishing or adjusting policies and programs; In the context of digital transformation, women need to be supported to improve their capacity, and create opportunities to participate and contribute effectively in this changing context.
Building extension capacity to provide gender-sensitive support and market-driven productions for smallholders and small enterprises by	Building capacity for agricultural policy makers with gender mainstreaming knowledge and skills and methods of designing gender-sensitive agricultural projects; Responsible investment in agriculture should pay particular attention to maintaining investment sustainability through capacity building and local empowerment. In fact, at present, investment projects in agriculture seem to have achieved a lot of results in the process of implementation. However, after the project ended, these achievements were not maintained when the project's staff and investments were withdrawn; At the central and provincial levels, the staff of research institutes, government, NGOs, and agencies should be trained to understand up-to-date policies of the state; budget coordination for related activities at grassroots levels; integrating training in secondary and high schools, vocational schools, and universities; Having a clear orientation on livelihood development for households, developing local agriculture in the direction of One Commune One Product (OCOP) with safe agricultural production or other good agricultural practice (GAP)-oriented production procedures that help not only to protect the environment but also to meet market demand and to improve incomes for agricultural smallholders. This also contributes to empowering women to engage more in agricultural business and off-farm activities to improve not only their income but their capacity for sustainable livelihood development; Increasing the participation of women in leadership and improving knowledge and skills of gender mainstreaming of staff managing and implementing policies and projects; There should be more appropriate policies to encourage young people of working age to return to their hometown to start up (to establish a career and do agriculture) clearly and on a large scale; Integrating training programs on entrepreneurship, analysis, and market development into training programs for schools, professional schools, universities, and training courses for business owners, cooperatives, and cooperative groups.
Facilitating partnerships and networks among CSOs, farmers' groups, indigenous peoples' groups and women's cooperatives to support women's economic empowerment.	Collecting opinions of women to contribute to the construction of local agricultural works and the agricultural production process such as crops, plant and animal varieties, and division of labour; Strengthening methods of research and implementation of participatory projects in which women can voice their needs and desires and contribute to sharing their productive labour experience; Promoting the role and participation of women in training activities on agricultural production knowledge, encouraging women to boldly participate in the process of high-tech production and applying science and technology. Using agricultural digital transformation in the production and market search and participation in e-commerce platforms to consume agricultural products.
Enhancing the roles of mass organizations and civil society in promoting gender mainstreaming is also a good action.	At the local level (districts, communes, and communities): training for key officials in mass organizations (women's unions, farmer's unions, youth unions...) on basic concepts of RAI and roles of gender in agriculture and rural development; Coordinating with agencies working on gender equality at the same level such as the Labour Department and the Women's Union to consult and implement activities considering necessary gender factors; Connect with CSOs that are mobilising resources and sharing information among stakeholders.
Setting up an institutional monitoring system or scheme to track progress in gender mainstreaming in agriculture.	At central level: issuing implementation guidelines and policy documents that show the importance of gender mainstreaming and encourage projects to integrate gender activities in their components; Making gender indicators one of the compulsory indicators in agricultural programs and projects, which are monitored and evaluated like other development indicators; Improving the quality and availability of reproductive, maternal, and child health care services in ethnic minority areas; Monitoring and supporting the community to carry out activities for RAI with gender mainstreaming that needs to be more realistic and adaptive to villages, communities, and regions.

4. Conclusions

Gender issues and gender inequality still exist in Vietnam, not only among ethnic groups, but also within each ethnic group and between rural and urban areas. Rural women tend to suffer more from economic disadvantage, lack of confidence in family and communities, face more difficulties in accessing health, social services, and resources, and have less accessibility to technical training and market compared to men. These issues place women in fewer decision-making roles both in business and at home. Women were found to be more disadvantaged in digital agricultural transformation. Gender mainstreaming activities have only recently become apparent in NGOs, while they are still vague in projects and programs led by the state.

In order to address gender inequality issues, it is necessary to continue promoting gender mainstreaming in state-led rural development activities. At the same time, it is also necessary to improve the capacity of women to make them eligible for and actively participate in development activities. In the context of digital transformation, it is also necessary to assess the opportunities, challenges, and major problems facing women and girls in the digital transformation process. Creating opportunities for women to promote their strengths and address issues that digital transformation exclusive to women is especially important to those in local, rural, and remote areas.

Following is a list of proposed actions to promote gender equity: i) Improving women's access to education and legal redress mechanisms, and women's ability to collectively mobilise and claim political rights; ii) Building extension capacity to provide gender-sensitive supports and market-driven productions for smallholders and small enterprises; iii) Creating favourable environments for women to promote their creativity, research and apply new technologies in start-ups, look for job opportunities and do business in line with the requirements of the digital economy and make policies to improve women's capacity and skills for digital integration and transformation, ensuring women's access to the digital transformation process so that no woman is left behind; iv) Facilitating partnerships and networks amongst civil society organizations, farmers' groups, indigenous peoples' groups, and women's cooperatives to support women's economic empowerment; v) Enhancing roles of mass organizations and civil society in promoting

gender mainstreaming; vi) Setting up institutional monitoring system or scheme to track progress in gender mainstreaming in agriculture, especially gender mainstreaming in government's programs and projects.

CRediT author statement

Nguyen Huu Nhuan: Conceptualisation, Methodology, Data curation, Data analysis, Writing, Editing and Finalising; Nguyen Thi Thu Huyen: Methodology, Data collection, Data analysis, Writing, Editing and Formatting; Ngo Thi Khanh Ly: Data collection and processing, providing some inputs for writing.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] International Labour Organisation (2021), "Employment in agriculture (% of total employment) (modelled ILO estimate)", <https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=VN>, accessed 12 September 2022.
- [2] General Statistics Office of Vietnam (2023), "Population and employment", <https://www.gso.gov.vn/en/statistical-data/>, accessed 12 September 2022.
- [3] Food and Agriculture Organization of the United Nations (2021), "Responsible land-based investments in the Mekong Region: A comparative analysis of the legal frameworks of Cambodia, Lao People's Democratic Republic, Myanmar and Vietnam", <http://www.fao.org/3/cb3937en/cb3937en.pdf>, accessed 13 September 2022.
- [4] Central Committee of the Communist Party of Vietnam (2008), *Resolution No. 26 NQ/TW Approving The Secretariat Committee of The 14th Central Regional Agreement on Agriculture, Farming and Rural Resources* (in Vietnamese).
- [5] United Nations Development Programme in Vietnam (2022), "Women's political participation and innovations key Vietnam's sustainable and inclusive development", <https://www.undp.org/vietnam/press-releases/womens-political-participation-and-innovations-key-viet-nams-sustainable-and-inclusive-development>, accessed 12 September 2022.
- [6] D.N. Quoc, V.D. Nguyen (2019), "Gender inequality in the transition economy: A study of double burden of Vietnamese women", *The 10th NEU-KKU International Conference on Socio-Economic and Environmental Issues in Development*, Hanoi, Vietnam, pp.650-665.
- [7] T.T.K. Van, E. Elahi, L. Zhang, et al. (2018), "Gender differences in formal credit approaches: Rural households in Vietnam", *Asian-Pacific Economic Literature*, **32**(1), pp.131-138, DOI: 10.1111/apel.12220.

- [8] H.T. Hoa, P.V. Hieu, N.T. Thao, et al. (2020), "Research on income inequality by gender in Vietnam", *International Journal of Human Resource Studies*, **10**(3), pp.206-222, DOI: 10.5296/ijhrs.v10i3.17538.
- [9] I.A. Chowdhury, H.C. Johnson, A. Mannava, et al. (2018), "Gender gap in earnings in Vietnam: Why do Vietnamese women work in lower paid occupations?", *World Bank Policy Research Working Paper*, **1**, 38pp, DOI: 10.1596/1813-9450-8433.
- [10] M. Wells (2005), "Vietnam: Gender situation analysis", *Strategy and Program Assessment*, Prepared for the Asian Development Bank, 131pp.
- [11] International Labour Organization (2021), "Gender and the labour market in Vietnam", An analysis based on the Labour Force Survey, https://ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-hanoi/documents/publication/wcms_774434.pdf, accessed 12 September 2022.
- [12] General Statistics Office of Vietnam (2021), "Gender equality in labour and access to management work in Vietnam", <https://www.gso.gov.vn/en/data-and-statistics/2021/12/gender-equality-in-labor-and-access-to-management-work-in-vietnam/>, accessed 3 October 2022.
- [13] Committee for Ethnic Minority Affairs (2019), "Guidelines for the promotion and implementation of gender-responsive budgeting in the Socio-economic development programme for the most disadvantaged communes in the ethnic minority and mountainous areas (Programme 135)", <https://vietnam.un.org/sites/default/files/2019-08/RGB-P135-VIE-FINAL-COMPRESSED.pdf>, accessed 3 October 2022 (in Vietnamese).
- [14] P.L. Nguyen, K.C. Do (2020), "Education, employment, and income: An overview of rural-urban gaps in Vietnam", *Vietnam Journal of Agricultural Sciences*, **3**(2), pp.647-661, DOI: 10.31817/vjas.2020.3.2.08.
- [15] National Congress of the Communist Party of Vietnam (2014), *Law on Marriage and Family*, No. 52/2014/QH13 (in Vietnamese).
- [16] National Congress of the Communist Party of Vietnam (2016), *Child Law*, No. 102/2016/QH13 (in Vietnamese).
- [17] General Statistics Office of Vietnam (2010), "Keeping silent is dying", Results from the national study on domestic violence against women in Vietnam, <https://www.gso.gov.vn/du-lieu-va-so-lieu-thong-ke/2020/10/nghien-cuu-quoc-gia-ve-bao-luc-gia-dinh-doi-voi-phu-nu-o-viet-nam/>, accessed 3 October 2022 (in Vietnamese).
- [18] M. Ellsberg, E. Fulu, X. Warner, et al. (2019), *Ending Violence Against Women and Girls: Evaluating a Decade of Australia's Development Assistance*, Department of Foreign Affairs and Trade (DFAT), Canberra, 112pp.
- [19] C. Pross, J.Y.C. Han, D. Kim, et al. (2020), "Climate change, gender equality and human rights in Asia", *Regional Review and Promising Practices*, <https://asiapacific.unwomen.org/en/digital-library/publications/2021/01/climate-change-gender-equality-and-human-rights-in-asia>, accessed 3 October 2022.
- [20] National Congress of the Communist Party of Vietnam (2006), *Law on Gender Equality*, No. 73/2006/QH11 (in Vietnamese).
- [21] N. Menon, Y. Rodgers, A. Kennedy (2016), "Land reform and welfare in Vietnam: Why gender of the land-rights holder matters", *Journal of International Development*, **29**(4), pp.454-472, DOI: 10.1002/jid.3203.
- [22] T.H. Khuat, N.T.V. Anh, N.T.P. Thao, et al. (2016), "Social determinants of gender inequality in Vietnam: Findings of a research study between 2012-2015", *Technical Report*, Institute for Social Development Studies, DOI: 10.13140/RG.2.2.14062.41288.
- [23] N.T. Thinh, M.L. Lapa, A. Galie (2017), "Emerging gender issues in Vietnam pig value chain", *The 9th Asian Society of Agricultural Economists (ASAE) International Conference 2017: Transformation in Agricultural and Food Economy in Asia*, Bangkok, Thailand, pp.216-227.
- [24] N.T.D. Nga, P.V. Hung, D.N. Ha, et al. (2022), "Gender-focused analysis and opportunities for upgrading within Vietnam's smallholder pig value chains", *Frontiers in Veterinary Science*, **9**, DOI: 10.3389/fvets.2022.906915.
- [25] R.H. Bosma, T.D. Nguyen, L.M. Calumpang, et al. (2018), "Gender action plans in the aquaculture value chain: What's missing?", *Reviews in Aquaculture*, **11**(4), pp.1297-1307, DOI: 10.1111/raq.12293.

Using expert evidence on intellectual property: A practical perspective

Huu Can Nguyen*

Vietnam Intellectual Property Research Institute, 39 Tran Hung Dao Street, Hang Bai Ward, Hoan Kiem District, Hanoi, Vietnam

Received 13 January 2023; revised 20 February 2023; accepted 27 February 2023

Abstract:

Intellectual property (IP) is a specialised field of expertise that is not only related to legal issues of IP rights but also to the application of knowledge, experience, and skills in technical and economic aspects. There have been many studies on the role and legal value of expert evidence in IP disputes and infringement cases. In the case of IP dispute and infringement to be resolved in the courts, the duty of these experts is to provide professional opinions in a way that is completely impartial, independent, reasonable, and transparent. It can be said that in a majority of cases, reliance on expert evidence demonstrates the role of expert opinions in assisting IP enforcement authorities in reaching their final decision on the case although the authorities are not bound by such evidence. Based on global practices, this article attempts to answer some initial legal questions such as when does an expert opinion become evidence? Is expert evidence the product of legal expertise or technical expertise? Is the expert evidence an administrative decision, and under what circumstances can it be used?

Keywords: expert, expert opinion, expert evidence, expertising conclusion, intellectual property.

Classification number: 6

1. Who is the expert?

In recent years there has been much discussion on issues related to expert evidence in the field of intellectual property (IP) such as: the role and independence of experts; form of expert evidence; and the legal value of expert evidence in IP dispute and infringement cases [1].

In terms of IP, the use of expert evidence is considered common in countries with civil law as well as case law systems such as Brazil, Germany, Israel, and the United States [2]. The role of experts and expert evidence is increasing in IP disputes, especially in countries that have established specialized courts for IP such as China, Japan, Portugal, Switzerland, and England [3, 4]. According to Ms. J.P.M. Singh (2021) [3], an expert is a person with specialized training, special skills, and working experience in a certain field. An expert recognized for having knowledge, skill, experience, training, or profession may give evidence in the form of expert opinions or otherwise if scientific, technical, or the expert's other specialized knowledge is capable of

assisting the trier with facts in understanding the evidence or deciding the issue. If such evidence is based on complete data and facts, the product of reliable principles and methods can be applied to the facts of the case [4-6]. Therefore, the important issue in considering whether a person is recognized to provide an expert opinion is whether he or she fully meets the requirements for training, professional qualifications, experience, and is familiar with the related field. According to R. Manko (2019) [7], an expert is an independent person who has the necessary qualifications to be recognized by law.

According to J. Allsop (2005) [1], M. Matthew, et al. (2022) [4] and K.S. Cohen (2016) [8], the expert witness must be an objective party to the IP lawsuit and must not act as an advocate to interested parties. Any potential conflict of interest involving an expert that affects the objectivity of evidence must be reported to a court or dispute resolution authority, otherwise the probative value of the expert opinion will be unrecognized [9, 10]. In addition, expert evidence cannot be based on "subjective beliefs" or

*Email: nhatviet00@gmail.com

“unfounded conjecture” [6]. The role of the expert is to guide judges and juries on professional matters beyond their common understanding in an objective and impartial manner [9]. In patent-related cases, experts act as witnesses on technical aspects that require a high level of technical knowledge in the relevant technology area (such as knowledge, skills, experience, and approaches of a skilled person in the technical arts; technical conditions disclosed in the documents; characteristics of the allegedly infringing product; functions of the allegedly infringing production process...); or on legal aspects (such as interpretation of the scope of protection; assessment of novelty, inventiveness or other matters such as the nature of the product/process and technical elements analysis, opinions on infringement and patent validity in the context of prior art, or reasonable licensing fees in determining damage awards) [2, 3, 11, 12]. In trademark-related cases, experts can provide expert opinions on issues such as assessment of trademark reputation, consumer confusion, scope specification, and methods of conducting consumer surveys [3, 11, 13].

According to K.S. Cohen (2016) [8], in some countries only experts recognized by the court under the prescribed legal procedure can give expert opinions. In Germany and Brazil, for example, only a court-appointed expert is considered the official source of expert evidence, while in the United States and Australia it can also be an expert appointed by the parties [2]. Expert opinions should be based on a high degree of scientific, technical, and professional certainty, as well as the training and experience of the expert. Therefore, the expert should use all known facts of the case or any information from his or her previous experience or study as the basis for forming an expert opinion. These experts may be assisted by invisible experts in preparing their opinions.

2. What is the expert evidence?

According to K.S. Cohen (2016) [8], many different types of evidence exist. Evidence can be everything of what someone sees, hears, or smells; may be exhibits; and can also be someone’s opinion.

Stemming from the civil nature of IP dispute and litigation, expert evidence is closely related to the application of the provisions on evidence of civil procedure law because, in essence, this type of evidence serves as a basis for drawing conclusions about a certain issue or event. The data and

information on which expert evidence is based may include events observed by the expert himself or by others to the expert’s direct personal knowledge; evidence that has been recorded or provided in the course of the case with facts presumed to be true for the expert; or facts or data that are not evidence but may be accepted as the basis for the preparation of expert opinion [2]. The purpose of expert evidence is to assist the court in understanding more about technical or other issues beyond the judge’s knowledge and experience [4, 9, 11]. For example, in a patent dispute case, expert evidence is considered a type of extrinsic evidence, which plays a role in assisting the court in providing background understanding of a particular technology in the dispute, explaining the implementation of the invention, the technical aspects of the invention to the knowledge of a skilled person in the relevant art, or interpreting the terminology used in a patent description or cited prior art documents... [6]. Expert evidence should have a clear structure including hypothetical facts; the facts on which the expert’s opinion is based (including experimental results or other people’s data); scientific principles and methods; ways of making arguments and conclusions of experts on the subject matter; assumptions of the expert opinion due to incomplete data and information [1, 10, 13].

In accordance with the global legal system on IP, the expert evidence in IP dispute resolution and infringement cases can take many different forms. In many countries, the expert evidence can take the form of “expert testimonies” provided by experts with deep expertise in a particular scientific, technical, or professional field based on the application of reliable, scientific principles and methods, appointed by either the Court or chosen by the parties. With this form, the number of experts providing expert opinions is quite large and these experts can operate independently or in professional organizations. For the Court of Justice of the European Union (CJEU), experts can choose the form of their expert evidence (R. Manko, 2019 [7]).

3. The use of expert evidence

There have been many studies on the role and legal value of expert evidence in IP disputes and infringement cases. According to B. Picozzi (2015) [14], experts (like a solicitor general) are understood as those who provide expert opinions to the US Supreme Court (SCOTUS) in the majority of cases (70%). These experts are usually people with

competence, reputation, and expertise in the field of IP. In the case of IP dispute and infringement to be resolved in the Court (CJEU or the General Court), the task of these experts is to give professional opinions in a way that is completely impartial and independent, reasonable, transparent. Currently, in the EU, these professionals enjoy the same privileges as judges (immunity) and cannot be removed (retired from office) before the end of their six-year tenure (but can possibly be renewed). However, unlike judges, experts only have a professional advisory role and do not participate in the court's decision-making process in cases. Court opinions are given in the form of judgments, while expert opinions are based on a high degree of scientific or technical certainty or the expert's experience [8]. The basis of expert evidence is facts or anything from the expert's previous experience or study.

According to B. Picozzi (2015) [14], the SCOTUS relies on expert opinion in the majority (60-70%) of IP infringement cases. According to statistics of the CJEU, in the period 2015-2018, the number of expert opinions provided was as follows: 239 opinions (2015), 319 (2016), 301 (2017), and 305 (2018). R. Manko (2019) [7] believed that, in principle, in any case of IP dispute or infringement, the CJEU can appoint experts to provide expert evidence. Expert evidence in these cases play an important legal role although the Court is not bound by these opinions [9]. In recent years, the CJEU has tended to refer directly to the expert opinions of the particular issues as the basis for its ruling [7]. In the UK, the Patent County Court has the authority to decide whether or not to use expert evidence in a case and if so, how many experts each party is allowed to use (usually each party employs only one expert in one area of expertise)¹. However, in Germany, expert evidence is used less commonly than in the UK or the US, accounting for only about 5-10% of patent-related cases [15]. However, increasing complexity and technical difficulty makes the role of expert evidence ever more important. In the United States, according

to the Supreme Judicial Court (2019) [5], the magistrate judge has the power to decide whether or not the expert evidence supports trial decision making. In India, expert evidence is used in civil and criminal IP cases and is considered "secondary" evidence. In fact, the majority (67%) of cases resolved by the Court are based on expert analysis and assessment. According to D. Llewelyn (2013) [10], in recent years, the use of expert evidence in IP dispute and infringement cases in Singapore and the UK is also common. In Singapore, for example, courts often seek the assistance of an expert who provides expert opinion on scientific, technical, or another specialized area. It can be said that in all cases, the reliance on expert evidence and especially on survey evidence demonstrates the role of expert opinions in assisting the court in reaching a final decision on the case in an objective, fair, and reasonable manner. As mentioned above, although the Court is not bound by this evidence, in practice, expert opinions play an important role in the Court's decisions.

In some countries such as China and Japan², expert evidence can be provided by technical investigators or judicial research officials who are employees of the Court (as of 2019, the IP District Court of Beijing has 89 experts and the IP Court of Japan has 11 experts). These experts provide expert opinions on technical issues related to the disputes and reply to the judge's questions on such matters with their opinions being considered by the judge for decision making [15]. In the United States and Europe, expert evidence can be provided by an attorney general who is a member of the Court of Justice or the IP specialized court. Europe currently has about 10 experts who provide expert legal opinions to assist the Court in resolving the dispute, but not in assigning a judgment on the case [7]³. Prosecutors should have appropriate knowledge and understanding of the content of the

¹At the first instance hearing, the content of a report provided by an expert of one party may be cross-checked by an expert of the other party, and this report is usually exchanged between the parties within a certain period (usually about 1-2 months before the first instance hearing) [11]. In the report, the expert should detail the documents and information used and the basis for giving the expert opinion.

²See more on:

Intellectual Property High Courts (2003), *Technical Advisors System*, <https://www.ip.courts.go.jp/eng/documents/expert/in-dex.html>, accessed 22 November 2022.

Managing IP Correspondent (2019), *China Patent: China Builds Technical Patent Investigator System*, <https://www.managingip.com/article/b1kbm1qrw3v8cd/china-patent-china-builds-technical-patent-investigator-system>, accessed 22 November 2022.

³The time for expert opinion is usually about 3-4 months from the time the disputing parties argue before the court, but in complicated cases, the above-mentioned time can be much longer [7].

expert evidence provided and should be able to challenge the evidence [9].

Courts generally strive to ensure that expert evidence is sufficiently reliable to be admissible and that expert opinions are relevant to the issues of the case. In the United States, under Rule 702 and Daubert in patent proceedings, the federal trial court must act as a “gatekeeper” in patent cases, specifically ensuring that any and all accepted expert evidence are not only relevant but also reliable. Expert evidence that does not meet those requirements cannot be admissible, whether or not the expert is a scientist [6]. According to D.G. Smith (2015) [6], reliability in expert opinions is required for all aspects of evidence: methods, data on which expert opinions are based, and relationships between facts and conclusions... Courts generally consider the following factors to determine the reliability of expert opinions: the extent and quality of the data used to base the expert opinion; validity and factual basis of the method used to form an opinion; reliability of the secondary data; and the adequacy of the information used to form an perceived expert opinion [9]. In IP cases, expert evidence may be challenged by the disputing parties, especially opinions on infringement of rights, interpretation of the scope of protection, and enablement of the inventions [6]. Even so, the parties have the right to cross-examine the other party’s expert as well as object to the expert’s evidence, and only when the expert of the other party is examined by a court are their opinions accepted as evidence [3].

4. Expert evidence in Vietnam: Some implications from practical perspectives

Expert evidence is used in many cases of IP rights disputes in Vietnam in the form of expertising conclusions. Expert conclusions are one source of evidence for competent agencies to settle the case and do not conclude on IP rights infringement activities or finally conclude on the dispute (Article 201.5 of the revised IP Law 2022). However, in practice, there are still misconceptions and confusion about the legal validity and use of this type of expert evidence. From this practice, there are some initial legal questions, such as when does an expert opinion become evidence? Is expert evidence the product of legal expertise or technical expertise, IP specialized expertise or judicial expertise? Is the expert evidence an administrative decision, and under what

circumstances can it be used? Up to now, since the promulgation of the IP Law 2005 and its regulations, the above issues have not been uniformly recognized. There does not seem to be any study that directly discusses this topic.

First of all, according to the civil procedure law in Vietnam (Civil Procedure Code 2015), evidence in a civil case are factual things that are handed to Courts by involved parties, agencies, organizations, and individuals, or gathered by Courts and are used by Courts as bases to determine objective details of the cases as well as to determine whether the involved parties’ claims or protests are well grounded and lawful or not (Article 93) with expertising conclusions considered as a source of evidence (Article 94). Expertising conclusions are considered evidence if such opinions are conducted in accordance with the procedures prescribed by law (Article 95). Thus, to be considered as evidence, the IP expertising conclusions must be: (i) true; (ii) lawfully provided or obtained; and (iii) related to the issue or event under consideration. Therefore, they can be used as a basis for conclusions about that issue or event. The competent agency to settle IP disputes and infringement cases has the right to decide on the evidence validity of the expertising conclusion, that is, the right to accept or refuse an expertising conclusion as evidence if it is found that the above requirements are not met. However, especially in civil or criminal procedures, experts are both procedural participants and judicial experts according to the case and IP expertising conclusions are not only expert evidence but also used by the Court as the basis to settle the case. In order to demonstrate the true nature of the case, the process of providing expert opinions needs to be accessible to objective facts and the reliability of this expert opinions depend mainly on the information or data provided by the interested parties, information on the legal status of the IP right in question, and information on market practices.

In Vietnam, few studies refer to the use of expert evidence as expertising conclusions on IP rights. For example, the project on IP Strategy to 2030 states that one of the most important supporting activities for the IP protection system are IP expertising conclusions. This is a service dedicated to providing “expert opinions” or “expert evidence” on issues related to the enforcement of IP rights including: determining the scope of protection of IP rights; determining the

similarity between the alleged infringing object and the IP right protected object; identifying infringement upon a certain IP right; and determining the value of damage caused by infringement of IP rights. Thus, in patent-related cases, the content of expert evidence is not purely about the technological aspects of the invention, but considers the legal aspects of the scope of protection as well as the analysis of infringement. In other words, in Vietnam expert evidence are the product of legal expertise and not technical expertise. The experts providing the expertising conclusions are not technical experts and their role is not to interpret the technical aspects of the invention.

The involved parties have the right to request the Court to solicit expert evidence or to request expertise by themselves. At the request of the involved parties or when deemed necessary, the judge shall issue a decision to solicit expertise (Article 102 of the Civil Procedure Code). Thus, IP expertising conclusions are provided at the request of one or more parties to an IP right dispute or as designated by an IP enforcement agency in order to serve the process of settling IP infringement cases. Statistics for the period 2009-2020 show that the demand for industrial property expertise services is increasing at an average of 15% per year and mainly from businesses and individuals, accounting for 87% of requests for expertising conclusions. During the period 2009-2021, about 7,500 cases of expertise were carried out of which 12.8% were solicited by the competent authorities, mainly by IP enforcement agencies (57.2% from inspection agencies, 49.9% from market management forces, and only 1.02% from courts). The majority of expertise requests are aimed at dealing with industrial property rights infringement (82%) and counterfeit goods (6.3%). According to the IP Vietnam (2017) [16], “the practice of industrial property expertising services as well as settlement of IP rights infringement shows that not all expertising conclusions requests are for the purpose of using these conclusions as a source of evidence for the settlement of industrial property rights disputes, but in many cases, it is the need to seek administrative conclusions to serve as a basis for issuing sanctioning decisions.” In many cases, the expertising conclusion requests are also made on matters within the knowledge of the enforcement agencies. The report on 10 years of implementation of IP Law stated that, “there is

inconsistent understanding of the legal validity of IP expertising conclusions provided by Vietnam Intellectual Property Research Institute - VIPRI,” and “most enforcement agencies when dealing with IP rights infringement still have to rely heavily on the expert opinions.” Meanwhile, practice shows that the understanding and application of legal principles on determining the scope of protection and analysis of rights infringement are inconsistent, leading to difficulties and confusion for IP enforcement agencies when making decisions on IP rights infringement.

In order to be recognized as an expert providing IP expert opinions, an individual must have a university degree or higher in a major relevant to the field of expertise, have professional activities in that field for at least five years, and satisfy the requirements of professional examination (Article 201.3 amended IP Law 2022). With such conditions, there are currently only four experts in the country recognized as IP experts providing expertising conclusions. According to the law on civil and criminal procedure, an expert witness is a person who has the necessary professional knowledge and experience as prescribed by law. In the field of IP, governmental agencies such as the Ministry of Science and Technology (MOST) and the People’s Committees of provinces or cities can issue decisions to recognize case-by-case judicial experts, demonstrating that compared to the above-mentioned experts, these people have met the conditions of knowledge and experience but have not undergone any examination or requirements for the actual practice of professional activities. Currently, there are six case-by-case judicial experts under the management of the MOST⁴. This shows that in practice the conditions for becoming an IP expert who can provide expertising conclusions are higher than that of a judicial case-by-case expert, while the nature of providing expert opinions is the same and the role of the evidence and experts in IP judicial proceedings is even higher than that of ordinary IP dispute and infringement proceedings.

⁴Ministry of Science and Technology (2022), *Decision No. 1229/QĐ-BKHCN Dated July 11, 2022 of The Minister of Science and Technology on The Publication of The List of Organizations and Case-By-Case Judicial Experts in Science and Technology Activities Under Management Authority of The Ministry of Science And Technology in 2022*, 4pp (in Vietnamese).

5. Conclusions

In summary, IP is a specialized field of expertise that is not only related to legal issues of IP rights but also to the application of knowledge, experience, and skills in technical and economic aspects. When there is a situation of conflict or dispute over IP rights, the resolution must be based on objective grounds of the related issues. Practices in many countries around the world and in Vietnam in the past show that, for many IP dispute and infringement cases, the IP enforcement agencies and/or stakeholders tend to use expert opinions as evidence to determine grounds and draw conclusions on a certain issue. In the future, in order for IP expert opinions to become evidence in Vietnam, they need to effectively assist the settlement of IP disputes and infringements. Regulations on the implementation of the amended IP Law 2022 need to focus on clarifying the principles of determining the scope of protection and analysing the infringement of rights in a clear, consistent manner based on theoretical and practical aspects. At the same time, it is necessary to have appropriate conditions for the recognition of case-by-case judicial experts, ensuring that these conditions are not lower than those required for IP experts. The IP enforcement agencies and other parties involved in a dispute should also understand the evidential value of expert opinions to avoid misinterpreting such expert opinions as the result of administrative procedure as if they were the subjects of an administrative appeal. Whether to accept the evidential value of expert opinions depends on the discretion of the IP enforcement agency.

COMPETING INTERESTS

The author declares that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] J. Allsop (2005), "Expert material and evidence in patent and trademark matters in the office and on 'Appeal'", *Federal Judicial Scholarship*, <http://classic.austlii.edu.au/au/journals/FedJSchol/2005/7.html>, accessed 22 November 2022.
- [2] A. Bennett, S.E. Farhaoui, K. Grabinski, et al. (2021), *WIPO Intellectual Property Judges Forum: Promoting Transnational Dialogue Among Judiciaries*, WIPO Judicial Institute, 23pp.
- [3] J.P.M. Singh (2021), "International judicial symposium on Intellectual Property 2021: Use of expert evidence in civil litigation", <https://www.jpo.go.jp/news/kokusai/seminar/document/chizaishihou-2021/10-06-04.pdf>, accessed 22 November 2022.
- [4] M. Matthew, C. Joyce (2022), "China's new provisions in court appointed experts in IP cases", *MMLC Group*, <https://www.hg.org/legal-articles/china-s-new-provisions-on-court-appointed-experts-in-ip-cases-38257>, accessed 22 November 2022.
- [5] Supreme Judicial Court, Advisory Committee on Massachusetts Evidence Law (2019), *Massachusetts Guide to Evidence*, Massachusetts Continuing Legal Education, Inc.
- [6] D.G. Smith (2015), "The increasing use of challenges to expert evidence under Daubert and Rule 702 in patent litigation", *22(2), J. Intell. Prop. Law*, pp.345-372.
- [7] R. Manko (2019), "Role of advocates general at CJEU", *European Parliamentary Research Service*, [https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/642237/EPRS_BRI\(2019\)642237_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/642237/EPRS_BRI(2019)642237_EN.pdf), accessed 22 November 2022.
- [8] K.S. Cohen (2016), *Expert Witnessing and Scientific Testimony: A Guidebook*, Routledge, 299pp.
- [9] CPS (2022), "Expert evidence", *The Crown Prosecution Service*, <https://www.cps.gov.uk/legal-guidance/expert-evidence>, accessed 5 August 2022.
- [10] D. Llewelyn (2013), "The use of experts in legal proceedings in Singapore involving intellectual property rights", *Singapore Academy of Law Journal*, **25**, pp.480-509.
- [11] Innovate Legal (2022), *Guide to Intellectual Property Disputes in The Patents County Court: A Step by Step Guide to The Process of Litigation*, http://www.innovatelegal.co.uk/Guide_to_the_Patents_County_Court.pdf, accessed 22 November 2022.
- [12] HG.org Leading Lawyers (2022), *Intellectual Property Disputes and an Expert Witness's Examination*, <https://www.hgexperts.com/expert-witness-articles/intelligent-property-disputes-and-an-expert-witness-examination-43287>, accessed 22 November 2022.
- [13] M. Biernacki, T.G.B. Deluzio (2019), *Effectively Using Experts in IP Litigation - Part 1: Theory*, <https://www.smartbiggar.ca/insights/publication/effectively-using-experts-in-ip-litigation-part-1-theory>, accessed 22 November 2022.
- [14] B. Picozzi (2015), "The Government's fire dispatcher: The solicitor general in patent law", *Yale Law & Policy Review*, **33(2)**, pp.427-456.
- [15] Managing Intellectual Property (2016), *Expert Witnesses in Patent Litigation Around The World*, <https://www.managingip.com/article/2a5c0ug7x98j3snqe054x/expert-witnesses-in-patent-litigation-around-the-world>, accessed 22 November 2022.
- [16] Intellectual Property of Vietnam (2017), *Summary Report of 10 Years of Implementation of The Intellectual Property Law*, <https://www.most.gov.vn/vn/tin-tuc/11919/du-thao-bao-cau-tong-ket-10-nam-thi-hanh-luat-so-huu-tri-tue.aspx>, accessed 22 November 2022 (in Vietnamese).

Vietnam and its international commitments and obligations of human rights: The case of the individual rights to life, liberty, and personal security in the time of COVID-19

Van Nghia Hoang^{1*}, Thi Van Anh Pham²

¹International Cooperation Department, Ho Chi Minh National Academy of Politics,
135 Nguyen Phong Sac Street, Nghia Tan Ward, Cau Giay District, Hanoi, Vietnam

²Faculty of Law, Soc Trang Provincial Political School,
88 Le Hong Phong Street, Ward 3, Soc Trang Province, Vietnam

Received 27 June 2022; revised 1 September 2022; accepted 23 September 2022

Abstract:

The respect, protection, and fulfilment of human rights has always been one of the foremost priorities of countries. The primary responsibility of such belongs to the state as recognized in international and national legal regulations. Indeed, international and national law, especially international human rights law, recognizes that in certain circumstances such as emergency cases human rights can be limited, temporarily restricted, temporarily suspended, or, based on the three basic reasons: (1) public security and public order, (2) public health and social ethics, and (3) the rights and interests of others. These restrictions must be established by law and under the principles of the rule of law, democracy, openness, transparency, and accountability. The vulnerability of restricting human rights during emergencies, such as the prevention of COVID-19 for public health reasons during the recent widespread pandemic, shows need and urgency for the theory and practice of crisis management and the guarantee of human rights on a global, regional, and national scale. Therefore, this article contributes to the analysis and interpretation of the theoretical and practical basis for ensuring human rights in emergency situations through Vietnamese legal provisions and practices of the right to life in time of COVID-19.

Keywords: COVID-19 pandemic, ensuring human rights, international and national law, Vietnam.

Classification numbers: 6, 7

1. International and national framework on right to life, liberty, and personal security

1.1. International legal framework

The rights to life, liberty, and personal security are fundamental rights enshrined in the International Bill of Human Rights, specifically, in the 1948 Universal Declaration of Human Rights and International Covenant on Civil and Political Rights of 1966 (ICCPR). Especially, the right to life is protected in ICCPR's Article 6, as stated: "every human being has the inherent right to life. This right shall be protected by law. No one shall be arbitrarily deprived of his life [1]".

The right to liberty and personal security is also enshrined in Article 9 of ICCPR: "everyone has the right to liberty and security of person. No one shall be subjected to arbitrary arrest or detention. No one shall be deprived of his liberty except on such grounds and in accordance with such procedure as

are established by law," and "anyone who is arrested shall be informed, at the time of arrest, of the reasons for his arrest and shall be promptly informed of any charges against him [2]".

The right to life is interrelated with the right to freedom of movement, therefore, Article 12 of the ICCPR affirms that the two main components of freedom of movement include: (i) an internal aspect, relating to freedom of movement within a country, i.e., "everyone lawfully within the territory of a State shall, within that territory, have the right to liberty of movement and freedom to choose his residence" and (ii) an external aspect comprising freedom of movement between States, i.e., the rights to leave one's country and the right to enter one's "own country". It can be seen that, according to the ICCPR, the subject of freedom of movement comprises all citizens, including foreigners. Thus, a foreigner living or lawfully present in a country also

*Corresponding author: Email: nghia.npa@gmail.com

has the right to freely move within the territory of that country without being obstructed [1].

Article 12.3 of the ICCPR also specifies that the right to freedom of movement and residence is not an absolute right, as it may be subject to certain restrictions depending on the law of the member state. Specifically, the right to freedom of movement shall not be subject to any restrictions except those provided by law for the purpose of protecting national security, public order, public health or morals, or the rights and freedoms of others, and must be consistent with the other rights recognized in the ICCPR. In 1984, the United Nations Economic and Social Council adopted “The Siracusa Principles on the Limitation and Derogation Provisions in the International Covenant on Civil and Political Rights”, which sets the principles and required limitations of exercising the right to movement as follows: i) any measures shall be provided for by law and be compatible with the object and purposes of the ICCPR; ii) none of the restrictions imposed must discriminate in violation of international human rights law; iii) any such measures should also meet strict requirements including legality, necessity, and proportionality; and iv) all limitations shall be applied in a non-arbitrary manner and in favour of the rights at issue [3].

The ICCPR’s General Comment No. 27, adopted at the 67th Session of the Human Rights Committee on November 2, 1999, also indicates that: “the permissible limitations which may be imposed on the rights protected under Article 12 must not nullify the principle of liberty of movement, and are governed by the requirement of necessity provided for in Article 12, paragraph 3, and by the need for consistency with the other rights recognized in the Covenant”. This means that the right to life needs to be ensured in line with some measures of restriction of other rights including the right to freedom of movement when necessary.

This international legal framework has already been incorporated into the Vietnamese legal system, especially in its Constitution and laws.

1.2. Vietnamese legislation on right to life, liberty, and personal security

The 2013 Constitution in particular, as well as the Vietnamese legal system in recent years, have made a great step forward in implementing recommendations on the right to life, liberty, and security of person through fulfilling international obligations and commitments provided in the 1966 ICCPR and other related treaties such as the 1989 UN Convention on the Right of the Child (CRC), the

International Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), as well as executing the recommendations of the 1948 United Nations Human Rights Council (UNHRC) about the Universal Periodic Review (UPR) on the implementation of human rights worldwide. Indeed, Vietnam has continuously improved its legal system, policies, and practices to ensure the rights to life, liberty, and security of person. The 2013 Constitution first mentioned the right to life as a separate right in Article 19: “everyone has the right to life. Human life is protected by law. No one shall be deprived of his life against the law” [4].

Institutionalizing the constitutional right in terms of right to life, Vietnamese law has gradually perfected and strengthened institutions as well as respected, protected, and fulfilled the right to life for all individuals and rights holders, especially vulnerable groups such as children, women, people with disabilities, people living with HIV / AIDS, the elderly, ethnic minorities, and people living in remote areas.

The Vietnamese legal system, including the 2015 Penal Code and the 2015 Criminal Procedure Code (effective 2018), continues to codify constitutional principles of the right to life and rights related to the right to life.

The right to life is a basic human right, the supreme right out of the fundamental rights and freedom of each person, community, and the entire humankind.

Human rights are unified, inseparable, inalienable, and interdependent. However, there are rights that play a role as prerequisites for the implementation of each person’s other fundamental freedom and rights. In particular, the right to life is considered a supremacy because it is a prerequisite for deciding all other human rights as recognized in the core documents of international human rights law. Article 3 of the Universal Declaration of Human Rights (UDHR) of 1948 states: “everyone has the right to life, liberty and security of person”. Meanwhile, Article 6 of the International Covenant on Civil and Political Rights (ICCPR) concretizes Article 3 UDHR, which states: “every human being has the inherent right to life. This right shall be protected by law. No one shall be arbitrarily deprived of his life (Clause 1)”. Along with the ICCPR, some other international human rights conventions also address the right to life: Convention on the Rights of the Child, Convention on the Prevention and Punishment of Genocide, Convention on the Suppression and Punishment of the Crime of Apartheid, and the Convention against Torture, among others.

On March 31, 1982, Session 132 of the Committee approved General Comment No. 36 on the right to life of Human Rights Committee (the UN Specialized Committee formed from ICCPR). It details a specific and clear explanation on the characteristics and content of the right to life that was not specified in the ICCPR, namely, 1) the right to life is a supreme right of all human beings, need to be respected and no derogation is permitted under any circumstances, including national emergencies... (Paragraph 2) [4] and 2) the right to life is a right that should not be explained in a narrow way. It is directly related to each person's basic freedom including the entitlement of individuals to be protected from acts and omissions that are intended or may be expected to cause their unnatural or premature death, as well as to enjoy a life with dignity (Paragraph 3) [4]. Thus, the guarantee of each person's right to life is directly concerned with other fundamental rights, including moral rights, civil, political rights (such as the right to freedom of security, personal safety, the right to respect for integrity of life, dignity, humanity, honour, prestige... the right to live in peace, to resist armed conflict, ethnicity and religion conflict, etc.), as well as socio-economic rights (such as the right to health care, the right to escape poverty, and to combat natural disasters, epidemics, malnutrition, and underdevelopment [4].

Therefore, the United Nations also recommends that member states, to ensure the right to life, should create and preserve peace, and prevent armed conflict, conflict of ethnicity and religion, racism, ethnicity discrimination, or any other discrimination, as well as fight against war and arms races, nuclear weapons, chemical or other mass weapons, promote dialogues, cooperation in development, and ensure children's rights to life from the foetus, take measures to eliminate malnutrition and diseases leading to deprivation of the right to life, especially infants, pregnant mothers, or other vulnerable groups.

Vietnam has especially respected the right to life, as shown in its legislative tradition. For example, the Penal Code of the Ly Dynasty recognized the contents of this right, which has also been represented in Constitutions from 1946 to 1992. However, for the first time in the history of more than 70 years of constitution and legislature of the modern Vietnamese state, the concept of the right to life and protection of the right to life has been codified into a constitutional principle with full concepts and connotations of the right to life. Accordingly, the 2013 Constitution reaffirms: firstly, the right to life is "a fundamental human right that under any circumstances, even in a state of national emergency, cannot be violated..." and, secondly, the

right to life relates to other fundamental rights and freedoms, including the right to dignity, honour, bodily integrity, health (physical and mental), life, and, at the same time, relates directly to other basic conditions for the existence of biological, natural, and social human beings. Therefore, the right to life is directly associated with the right to the access of clean water, unpolluted air, clean food, the right to timely medical examination and treatment, non-discrimination, and equal and fair access to the healthcare system, the right to protection, care, and social welfare, benefits in case of natural disaster and enemy-inflicted destruction threatening the health and life of each person and community. For vulnerable groups, such as children and women, the right to life requires member states to take effective measures to reduce child mortality and increase people's life expectancy such as measures to eradicate malnutrition among children and pregnant mothers, eradicate epidemics and pandemics, to have access to affordable drugs and preventive vaccinations,... ie including both passive and active measures. Thirdly, the guarantee of the human right to life is synonymous with preventing common threats to the right to life such as war and particularly serious crimes such as genocide or crimes against humanity. Therefore, fighting against war and these crimes is also a guarantee of the right to life. Fourthly, member States should take measures to prevent and punish deprivation of human lives by any arbitrary or illegal action caused by any entity (such as terrorism, conflict, war, ...), particularly, abduction and causing an intentional disappearance is also considered as one of the forms of deprivation of the right to life. Fifthly, it is necessary make progress toward the elimination of the death penalty in the Penal Code. This requires continuous improvement of the legal system to limit the application of the death penalty apparently in some countries today. Furthermore, the principles of implementing the right to an effective complaint or the right to pardon or to request a change of penalty should be applied to ensure the right to life. At the same time, in the short term, it is necessary to continue to apply the principles of humane criminal policies, not to sentence the death penalty for offenders under 18 years old and not to perform the death penalty on pregnant women.

The Vietnamese legal system has been constantly improving to ensure the right to life of human beings, especially for children, even as a foetus (from the 12th week or more). The 1989 Convention on the Rights of the Child affirms that "children need special safeguards and care, including appropriate legal protection, before as well as after birth".

Over the years, recommendations from Human Rights Committees and the United Nations Human Rights Council have suggested that Vietnam abolish the death penalty and strengthen measures (including legislative, executive, and judicial) to more effectively protect the right to life, especially children, pregnant mothers, women, and other vulnerable groups.

Article 6 of the International Covenant on Civil and Political Rights states that the death penalty is only allowed for the most serious crimes, based on the current law at the time the crime is committed. Thus, international law does not prohibit countries from using death penalty, but encourages limitations and aims to abolish this penalty. Vietnam has been making efforts to supplement and perfect the legal system to limit the death penalty in order to gradually move towards the abolition of the death penalty in the future when conditions permit.

So as to internalize ICCRP regulations and recommendations into the legal system, Vietnam has revised the Penal Code and Criminal Procedure Code towards better assurance of human rights in general and the right to life in particular. The current Vietnamese Penal Code stipulates the death penalty for 22/272 crimes, a significant reduction as compared to before. Regarding the death penalty, the Vietnam Penal Code (2015) has been gradually amended and supplemented in the direction of reducing the number of laws regulating the death penalty in the Penal Code (1999) from 29 articles (accounting for rate of 11%) to 22 articles after being revised in 2009 (accounting for 8%) and the 2015 Penal Code continued the decrease to 15 articles (accounting for 5%). In addition, the 2015 Penal Code also expanded subjects not applicable for the death penalty (e.g., people aged 75 years or more when committing crimes or when sentencing). The method of executing the death penalty has also been revised in a more humane direction, shifting from being shot to injection, while the law also strictly regulates conditions for the application of the death penalty. Although the death penalty is prescribed for 15 crimes, in practice, the Courts mainly apply the death penalty to some cases of murder and the illegal production and sale of narcotics.

The proportion of crimes with the death penalty over the total number of crimes committed by the 2009 Penal Code is 22/272 (over 8%), 3% lower compared to the 1999 Penal Code; approximately 6.87% lower compared to the 1985 Penal Code and 12.64% lower compared to the 1985 Penal Code [5]. There are a total of seven crimes with the death penalty removed in the 2015 Penal Code, including: property theft; producing and trading banned goods as food; illegally possessing

narcotics; appropriation of narcotics; destroying works, facilities, and crucial means to national security; contradiction of orders; and surrender to the enemy. At the same time, the Penal Code has also removed the charge of illegal armed activities that was previously assigned to the death penalty.

Although the current Penal Code provides the death penalty for 18 crimes, in reality, the Vietnamese Courts mainly applied this penalty to murder and possession, transportation, illegal trading, or appropriation of narcotics [5].

Along with the constitution and some related basic laws, such as 2015 Civil Code, 2015 Penal Code, 2015 Criminal Procedure Code, 2009 Law on State Compensation Liability, 2016 the Law on Children, etc., and other legal documents, there has been constant improvement to ensure each individual's right to life. Moreover, sub-law documents such as Decrees of the Government, Resolutions of the Judicial Council of the Supreme People's Court, and Circulars of Ministries and Agencies contain guidelines and regulations to ensure the right to life for everyone in the spirit of the ICCPR Convention and implement recommendations of the United Nations Human Rights Council at Universal Periodic Review (UPR) sessions.

These include new provisions to guarantee rights related to the right to life for groups at high risk of deprivation of the right to life such as detainees, arrestees, defendants, the accused, and persons serving imprisonment in the process of participating in the proceedings. The Constitution and laws of presumption of innocence (a person shall only be found guilty after a legally valid judgment declared by the Court), the right to silence, the right to have an advocate, the right to a fair trial without delay,... or the right to be protected from arrest without the Court's decision, the Procuracy's approval decision (except caught in the act of committing an offence).

The very encouraging result in the improvement of the law to strengthen the guarantee of the right to life is the continuous decrease of the number of crimes with death penalty provisions. Criminal law in recent years has also amended this penalty application procedure to be more consistent with international human rights law standards. For example, the 1999 Penal Code abolished provisions relating to the execution of the death penalty immediately after the trial in special cases, which had been referred in the previous Penal Code, and, at the same time, supplemented the subject not applicable to this penalty were women raising a child under 36 months old when committing an offense or being tried.

2. Implementation of the individual's right to life, liberty and personal security

2.1. Achievements

Vietnam has been actively implementing international legal commitments related to human rights on the principle of *Pacta sunt servanda*, in all fields and at all levels, from the central government downward to local institutions. These include the legislative, executive, and judicial measures, as well as national programs and action plans for executing these commitments.

In regard to this, the development of legislation related these rights have been consistently improved. For instance, the right to liberty and personal security has always been respected, protected, and enforced through the improvement of the legal system and guaranteed practice. Right in Chapter 2 of the 2013 Vietnamese Constitution, the institution of human rights and citizenship has affirmed the right to liberty and personal security. Articles 21 and 22 of the Constitution stipulate that everyone has the inviolable right to private life, personal secrets, and family secrets as well as the right to protect his honour and reputation. Information about private life, personal secrets, and family secrets are fully protected by law.

Everyone has the right to confidentiality of correspondence, telephone calls, telegrams, and other forms of private communication. No one is allowed to unlawfully open, control, or seize other people's correspondence, telephone calls, telegraphs, or other forms of communication. Article 22 states that citizens have the right to a legal residence and everyone has an inalienable right to this accommodation. It also states that no one may enter another person's residence without his or her consent and that the examination of accommodation is required by law. Article 24 of the Constitution stipulates that everyone has the right to freedom of belief and religion, following or not following any religion. Thus, all religions are equal before the law. The State respects and protects the right to freedom of belief and religion. No one is allowed to infringe upon the freedom of belief or religion or take advantage of beliefs or religions to violate the law. Specifically, Article 20 of the 2013 Constitution states: "1. everyone has the right to body inviolability, to be protected by the law in terms of health, honour and dignity; not subject to torture, violence, persecution, corporal punishment or any other form of treatment that infringes upon the body, health, or offends honour or dignity; 2. no one will be arrested without a decision of the People's Court, a decision or approval of the People's Procuracy, except

a crime in the act of committing an offence. Arrest and detention shall be stipulated by law; and 3. Everyone has the right to donate human tissues and organs and donate corpses in accordance with the law. All medical, pharmaceutical, scientific experiments or any other form of experiment on a human body must have the consent of the that person". At the same time, Article 21 states: "1. everyone has the inalienable right to privacy, personal secrets and family secrets; has the right to protect his honour and reputation. Information about privacy, personal secrets and family secrets are secured by law and 2. Everyone has the right to confidentiality of correspondence, telephone, telegram and other forms of private communication. No one is allowed to open, control, illegally seize other people's correspondence, telephone, telegram and other forms of exchanging private information". Finally, Article 22 states: "1. citizens have the right to a legal residence and 2. everyone has an inviolable right to the residence. No one is allowed to enter another person's residence without his or her consent [6]".

These are regulations directly related to liberty and security of person. In addition, Articles 23 through 25 of the 2013 Constitution also establishes rights related to the implementation of liberty and security of person, including the right to freedom of movement and residence within the country as well as the right to travel abroad and return home from abroad (Article 23). Meanwhile, Article 24, Clause 1 and 3 state the right to freedom of belief, religion, following or not following a religion and no one may infringe upon the freedom of belief or religion or take advantage of a belief or religion to violate the law. Then, Article 25 states the freedom of speech, freedom of the press and access to information, assembly, association, and demonstration with the exercise of these rights prescribed by law [6].

The Penal Code, Civil Code, and a series of other specialized laws have codified moral rights in general and the right to liberty and security of person in particular. Civil Code 2015 has a separate section with 15 articles detailing moral rights in which moral rights are civil rights attached to each individual, which cannot be transferred to others unless otherwise stated by relevant laws. Private life, personal secrets, and family secrets are inviolable and protected by law. The collection, storage, use, and publicity of information related to private life, personal secrets, and family must be approved by such person and family. Individuals have the right to request the court to deny information adversely affecting their honour, dignity, or reputation. The protection of honour, dignity,

and prestige can also be performed after an individual passes away at the request of a spouse or adult child.

The guarantee of personal freedom and security is closely related to the right to private life, the right to respect for correspondence, dignity, and honour of individuals, especially in the digital age, when freedom of information, social networks, internet use are prevalent in Vietnam. The protection of privacy and personal security includes being protected from the arbitrary use of personal images without permission or consent from that individual (i.e., the use of an individual's image must be agreed upon by the person who has that image). According to Article 32 of the Civil Code, the person possessing the image has the right to request the court to issue a decision to force the violator, relevant agencies, organizations, or individuals to revoke, destroy, and terminate the use of the image and provide compensation. However, civil law also stipulates cases in which the image can still be used without the consent of the person having the image or the legal representative of that person including: the images used from public activities such as conferences, seminars, sports competitions, performing arts, interviews, or press conferences; images used for the benefit of the nation and public interest; and community activities without harming the honour, dignity, or reputation of the person without copyright infringement. Although the provisions of the Constitution and Vietnamese law have basically created a legal framework for the protection of freedom and personal security, the practice of ensuring this right indicates the necessity to perfect the system of law towards strengthening sanctions, measures, and mechanisms for its effectiveness. For example, defaming the dignity, honour, prestige, etc., of others can cause serious consequences (there are cases leading to the deprivation of the right to life of others). Thus, it is essential to impose serious punishments for arbitrary uses of images or letters of other people.

To codify the Constitutional principles of the right to liberty and personal security, Civil Code 2015 has concretized 15 relevant articles. Article 38 of the Code prescribes the right to private life, personal secrets, and family secrets, as follows: "1. private life, personal secrets, and family secrets are inviolable and protected by law. 2. The collection, storage, use and publicity of information related to private life or personal secrets must be consented by that person, the collection, storage, use and disclosure of information related to family secrets must be approved by family members, unless otherwise stated by law ... 4. The parties in the contract are not allowed to disclose information about each other's private life, personal

secrets, and family secrets that they have known during the process of establishing and implementing the contract, unless otherwise agreed" [6].

With these provisions, Vietnamese law has recognized "the right to confidentiality of private life" in terms of protecting information related to the privacy that an individual wishes to be kept confidential. In case that person proactively discloses information, it shall not be considered private and shall not be protected by law if such information is used by others.

At the same time, Vietnamese law has specified the right to confidentiality of correspondence, telephone, telegram and other forms of private information exchange including the right to information protection through uses such as mobile phone, electronic mail, and social networks. Civil Code 2015 stipulates: "mail, telephone, telegraph, electronic database and other forms of private information exchange of individuals are guaranteed to be safe and confidential. The opening, control, and seizure of correspondence, telephone, telegram, electronic database and other forms of private information exchange by other persons can only be carried out in the case specified by law (Clause 3, Article 38)" [6].

The Penal Code 2015 also institutionalizes the constitutional protection of this right in Article 159. Crimes infringing upon the confidentiality or security of correspondence, telephone, telegraph or other forms of private communication of others are stipulated as follows: "1. any person who commits one of the following acts, had been disciplined or got an administrative penalty for this act but still commits a violation, shall be subject to a warning or a fine of between 20 million VND and 50 million VND or a fine of non-custodial reform for up to 3 years: a) Appropriating correspondence, telegraph, telex, fax or other documents transmitted by post or telecommunications network in any forms. b) Deliberately damaging, misplacing or intentionally taking information and contents of correspondence, telegraph, telex, fax or other documents transmitted by post or telecommunications network; c) Illegally listening or recording conversations; d) Illegal examination and seizure of correspondence or telegram; e) Other acts of infringing upon the confidentiality or security of correspondence, telephone, telegraph, telex, fax or other forms of private information exchange" [6].

The right to privacy is also institutionalized in specialized legal documents such as the Press Law of 2016 (in effect since January 1, 2017), prohibiting the act of "disclosure of information about the State's secret

list, personal privacy, and other secrets according to the provisions of law (Article 9)". At the same time, this law also stipulates that "no one can abuse the right to freedom of the press, the right to freedom of speech in the press to infringe upon the interests of the State, the legitimate rights and interests of organizations and citizens (Article 13)" and that journalists "(d) Must correct, apologize in case of providing false information, distorting, slandering, offending the reputation of agencies and organizations, honour and dignity of individuals (Article 26)".

The Law on Network Information Security of 2015 also defines the principles of ensuring network information security in Article 4 as follows: "1. agencies, organizations and individuals are responsible for ensuring network information security. Activities of network information security of agencies, organizations and individuals must comply with law, ensure national defense and security, state secrets, maintain political stability, social order and security and promote socio-economic development; 2. Organizations and individuals are not allowed to violate the network information security of other organizations or individuals; and 3. The handling of network information security incidents must ensure the legitimate rights and interests of organizations and individuals, not infringe upon private life, personal secrets and family secrets of individual, private information of the organization..."

However, the respect and protection of an individual's right to private life is not applicable in all cases. The 2013 Constitution also has provisions that limit this right in some cases to ensure national security, social ethics, public health, etc. Specifically, Article 14 (2) of the 2013 Constitution stipulates: "human rights, civil rights can only be restricted according to the provisions of law in necessary cases for reasons of national defense, national security, social order and safety, social virtue, community health". At the same time, Article 15 states: "1. citizen's rights are inseparable from civil obligations; 2. Everyone has the obligation to respect the rights of others; and 3. Citizens have the responsibility to fulfill their obligations towards the State and the society. The exercise of human rights and citizen's rights must not infringe upon the interests of the nation, the legitimate rights and interests of others". Therefore, human rights in general and right to liberty and security of a person in particular can be restricted in the case of protecting national interests and protecting other fundamental legitimate rights and interests of a residential community. The recent practice has shown that with the COVID-19 pandemic, the restriction on

right to privacy of the health status of individuals, the disclosure of identifications and itinerary of individuals positive for COVID-19, etc., are necessary for public health, security, and freedom of others.

Clause 2, Article 46 of the Law on E-transactions 2015 stipulates: "agencies, organizations and individuals are not allowed to use, provide or disclose information about privacy or information of other agencies, organizations and individuals that they have access to or take control in electronic transactions without consent, unless otherwise provided by law". In addition, Article 25 of the 1989 Law on the Protection of People's Health stipulates the responsibility of physicians is "to protect the confidentiality of patients related to illness or privacy that they have information about". Especially, Article 159 of the Penal Code 2015 (amended and supplemented in 2017) stipulates the crime of infringing on confidentiality or security of correspondence, telephone, telegram, or other forms of exchanging private information of other people. The following statistics demonstrate the vulnerability of the personal right to security in the time of widespread internet use. According to data from Kaspersky Security Network, in 2018, Vietnam was among the top three countries with the most cyber-attacks. In the digital age, threats to cybersecurity are becoming more and more sophisticated. In particular, in the context of the Industrial Revolution 4.0, Vietnam has been facing complex changes in cybersecurity, protection of human rights in general and the right to personal freedom in particular, especially the right to privacy. On June 12, 2018, at the 5th session of the 14th National Assembly, the Law on Cyber Security was passed, which is a very crucial legal basis clearly demonstrating the superiority of Vietnamese law. The Law on Cyber Security has internalized international standards, institutionalized the Party's views, and concretized the 2013 Constitution regarding the protection of human rights and citizenship in the context of integration and development.

In response to the COVID-19 pandemic that could take hundreds of thousands or millions of lives, the Communist Party of Vietnam and the State have actively deployed many adequate policies and programs in order to ensure the right to life of all individuals and social groups, especially the most vulnerable people such as the elderly, children, women, ill, and poor. These, among others, make up the nationwide campaign and program of vaccination for all, and demonstrate that "people are centred and ahead of other economic priorities". For example, Vietnam's policy of establishing a vaccine fund for COVID-19 prevention and control has been recognized

and appreciated by the international community. Assistant Dr. Kidong Park, World Health Organization Representative of Vietnam said: “the mobilization of resources to improve access to COVID-19 vaccines by the Vietnamese Government is very timely, in line with the Global Vaccine initiative” [7].

Guarantee of the right to life in the time of COVID-19 means that the foremost objective of the State must be responsibility to vaccinate as many people as possible and as soon as possible. As of September 29, 2021, the total number of vaccine doses administered in Vietnam was 42,165,168 doses of which the first dose makes up 32,669,057 and the second dose 9,496,111. Indeed, Ho Chi Minh City has already administered the 1st dose of vaccine to over 9 million people (the country's highest figure), reaching a rate of about 75% of people receiving the 1st dose and about 25% of the people receiving the 2nd dose [8].

2.2. Shortcomings

Although the Vietnamese legal system has continuously improved in the direction of enhancing the right to life, liberty, and security of person, reality shows that the Vietnamese legal framework still has a number of provisions that are not compatible with the international legal system, especially the international conventions of which Vietnam is a member state, which includes provisions on the protection of the right to life, liberty, and security of person. The context of market-based economic development, extensive international integration, digital age, IoTs and broadband, especially the context of the global COVID-19 pandemic in 2020, has posed great challenges to the implementation of the laws on the right to liberty and security of person.

In 2021, the second year that Vietnam was strongly affected by the COVID-19 pandemic, bringing the total number of COVID-19 cases to more than 1.3 million and more than 27,000 deaths, the unemployment rate increased to 2.52% (as of July 2021) [9]. The pandemic has directly affected the people's enjoyment of rights, especially living, traveling, and studying due to the need to social distance, which was applied across the nation to prevent the pandemic. Thus, alongside the impressive achievements of guaranteeing those basic rights, many challenges and difficulties regarding realizing those rights remain. The protection of the right to liberty and security of person, especially inviolable rights to body, honour, property, and personal privacy, etc., is an urgent issue now, more than ever, so as to build and perfect laws as well as ensure in practice. The infringement of privacy is a direct result of the lack of understanding the law, the sense of respect for

human rights of both law enforcement officer and the rights holder.

The right to liberty and security of person is a fundamental right of each person, a moral right defined in Articles 21 and 22 of the 2013 Constitution, in the relevant laws. However, in reality, there are still many shortcomings in ensuring this right in the context of increasing infringement with a more and more serious nature and its scale and scope directly affecting the right to life, liberty, and personal security. These include, among others, the five following shortcomings: i) the incomplete legal system and policy related to these rights in particular and to human rights in general; ii) the imbalance between the Party's guidelines and policies, laws, and practices; iii) the incapability of delivering and executing legal and policy frameworks into practice by many law and policy officers and civil servants at both central and local levels; iv) the inadequate awareness of laws and policies in general as well as of human rights in particular both by duty-bearers (public and civil servants) and rights-holders (the people); and v) the ineffective mechanisms for the monitoring and protection of the right to liberty and personal security.

According to the statistics, Vietnam is ranked 13th among 20 countries with the highest number of internet users in the world. As of December 2019, Vietnam had 64/97 million internet users of which 94% of internet users in Vietnam use the internet every day. The status of intentional or unintentional violation of internet users in general and social network users in particular has imposed on the reasoning of legal aspects ensuring right to privacy, right to life, liberty, and security of individuals and community. The consequences of not adhering to legitimate principles, not respecting and ensuring the right to privacy, life, liberty, and security of person by social network users are extremely serious violations that sometimes deprive individuals not only of the right to liberty but also the right to life. Since human rights are interlinked, correlated, and indivisible, the protection of all human rights is vital. The violation of the right to liberty and personal security in the time of ubiquitous internet and social media use might cause the violation of other rights, especially the right to life. During less than two years of COVID-19, the limitation in executing the right to personal security, especially in regard to individual privacy, has reached a record-high rate with thousands of cases occurring across the country due to the application and imposition of zone-classified policies for restricting an individual's free movement. Indeed, many localities have imposed their own harsher policies on movement, as well as

health registration and declaration that publicly disclosed a disclaimant's privacy and personal liberty.

Articles 21 and 22 of the Constitution stipulate that "everyone has an inviolable right to private life, personal secrets and family secrets; has the right to protect their honour and reputation". Information about private life, personal secrets, and family secrets are secured by law. Everyone has the right to confidentiality of correspondence, telephone calls, telegrams and other forms of private communication. No one is allowed to illegally open, control or seize other people's correspondence, telephone, telegram and other forms of information exchange. Article 22 states that citizens have the right to a legal residence and everyone has an inalienable right to the accommodation. No one is allowed to enter another person's residence without that person's consent. The examination of personal residence is prescribed by law. Article 24 of the Constitution stipulates that everyone has the right to freedom of belief and religion, following or not following any religion. All religions are equal before the law. The State respects and protects the right to freedom of belief and religion. No one may violate the freedom of belief or religion or take advantage of beliefs or religions to violate the law.

Article 32 of the Constitution stipulates that everyone has the right to ownership of legal income, savings, housing, living facilities, means of production, capital contributions in enterprises or in other economic organizations. Private ownership and right of inheritance are protected by law. In case there is an expropriation or requisition for reasons of national defense and security or national interests, in a state of emergency, natural disaster, and its prevention and control, etc., the State shall make up for individual's assets at market prices. Article 36 of the Constitution stipulates that men and women have the right to marry and divorce. Marriage is based on the principles of voluntariness, progressiveness, monogamy, equality, and mutual respect between husband and wife. The State protects marriage and the family and protects the interests of mothers and children. Article 38 of the Constitution stipulates that everyone has the right to health protection and care, equality in the use of medical services, and the obligation to comply with regulations on disease prevention, medical examination, and treatment. Any acts threatening the life or health of others and the community are strictly prohibited.

In fact, in order to ensure liberty and security of person, privacy is much related to the use of personal images, so the use of personal images must be agreed by those who own those images. If a personal image

is used for commercial purposes, the owner of the image must be paid, unless otherwise agreed by the parties. According to Article 32 of the Civil Code, the person possessing the image has the right to request the court to issue a decision to force the violator, relevant agencies, organizations and individuals to revoke, destroy, and terminate the use of the image as well as compensate for the loss. However, civil law also prescribes the cases in which the image is still used without the consent of the person owning the image or the legal representative of the person having the image, including: the image is used from public activities including conferences, seminars, sport competitions, art performances, interviews, press conferences, etc., images used for the benefit of the nation or public interests, etc., and community activities without harming the honour, dignity, or reputation of the person owning the image and without copyright infringement. In spite of being well and fully recognized in the Constitution and laws of Vietnam, challenges to freedom and personal security lie not only in the effectiveness of specific regulations but also in the protection and enforcement through the judicial system and other measures, especially education, dissemination, and propaganda together with practical action plans and programs of the Government and all level of branches.

One of the main limitations of ensuring liberty and security of person is restrictions in protecting the right to confidentiality and the inviolable right to private life, honour, dignity, and reputation of individuals in the digital age and in popular social networks today. These shortcomings consist of incomplete and asynchronous legal provisions as well as in the practices of implementing and ensuring these rights.

The inviolable right to private life, personal secrets, and family secrets have been recognized in the 2013 Constitution and institutionalized in a number of documents such as the Civil Code, the Penal Code, and Press Laws, but these regulations are just general principles and not specific enough to go deep into real life adjustments. These regulations are more general and formal than practical, and there is a lack of specific legal mechanisms to ensure the inviolable right to private life, personal secrets, and family secrets. Because Vietnam still does not have a separate law on the protection of privacy, the contents belonging to the category of privacy are still unclear. What content belonging to personal secrets/family secrets are necessary to be protected? How will an invasion of private life be handled? These are gaps in the provisions of the law on the protection of right to private life.

Because current law has unclear and unspecific regulations as mentioned above, it is difficult for people to access necessary information considered to be crucial evidence of a lawsuit and therefore, in many cases, authorities accidentally push the plaintiff into a dead end due to a general lack of agreement about the perception of right to privacy.

2.3. Causes

In the aforementioned analysis, there could be both subjective and objective reasons for the existing shortcomings to implementing the rights to life, liberty, and personal security. Inevitably, the main reasons for these shortcomings are: a) an inconsistent and incomplete legal system, lack of specific and detailed sanctions, and the lack of a specific institution in practice to ensure the inviolable right to privacy, personal secrets, and family secrets; b) the limitations on capacity, skills, and enforcement of policies and laws, especially from law enforcement staff at a grassroots level; c) the restrictions on sense of rule of law and awareness of human rights, respect for the culture of rights of both responsible subjects (cadres, civil servants, law enforcement, journalists, etc.), the duty-bearers, and the rights-holders (all human beings) especially in terms of right to life, liberty, and security of person; d) the incompleteness and asynchronization of institutions and the mechanisms for coordination responsible for monitoring and advising, protecting the exercise of the right to life, the right to privacy, liberty, and security of person, especially the lack of specialized, independent, and national agencies to protect and promote human rights of individuals in practice, and the lack of programs or action plans at both national and local levels on human rights in general and the right to life, liberty, and security of person in particular. The reason is there are contradictions in protecting the right to life and the right to liberty and personal security due to the severely spreading COVID-19 pandemic. These are, for example, the restriction of implementing the right to movement in order to protect the individual's right to life and personal security have also caused limitations to the enjoyment of other fundamental rights such as the right to association and assembly, the right to work, and the right to entertainment.

Freedom of movement is among the fundamental rights under the 1966 ICCPR to which Vietnam has been a member state since 1982. Freedom of movement not only creates the premise for an individual to enjoy civil, political, and other economic, social, and cultural rights, but also as a condition to promote the development of the economy and society of countries. Nonetheless, the right to freedom of movement is not

absolute and can be subjected to restrictions in certain circumstances, for example, in a time of emergency like during COVID-19.

The absence of an efficient, national, and independent institution has resulted in diminishing the effectiveness of the protection and promotion of human rights in general. Indeed, the protection of the right to life and the right to inviolability in terms of private life, personal secrets, and family secrets has not been effective and substantial. Moreover, information in the press is also a tool for a number of journalists to invade the private life of individuals. With a large and diversified press system covering the entire country from the central to local level, the press is an important information channel in propagating, disseminating, and educating about human rights while raising awareness to the practice of ensuring human rights. However, there is also a downside effect when the market creeps into the press and dominates communication, along with the understanding and awareness of the law and the rights of some press agencies and journalists. During the continuous development of the society and the explosion of information, some newspapers have shown signs of leaving their principles and operating purposes, pursuing profits and erroneous tastes, becoming a deceptive means of communication, trespassing and illegally spreading personal information to attract readers and this has adversely affected the reputation of the journalism. The press is sometimes the trigger increasing the violation of the privacy of individuals through hot news, soliciting by exploiting the private aspects of famous people (artists, etc.), often reporting without verification and consent in order to use images, private information, personal life and defame their honour, reputation and dignity. Some newspapers and reporters may also act as investigators, or judges by producing incriminating articles, or providing information on the identity and images of suspects, defendants, or victims, etc., in many investigations by the authorities.

There are some recent cases of violating the right to privacy such as cases related to the artist Tran Thanh or Ngo Kien Huy, which reveal the void of effective and synchronous legal regulations as well as mechanisms protecting these rights in our country today.

Although the legal framework for securing the right to confidentiality of correspondence, telephone, telegraphy and other forms of private information exchange is relatively complete, when the 2013 Constitution was enacted and came into effect, some legal documents were not yet amended according to the spirit of the new Constitution such as the

Postal Law, the Law on Telecommunications, the Information Technology Law, among others.

In addition, although the law has imposed penalties for violations of the right to confidentiality of correspondence, telephone, telegraphy and other forms of private communication, sanctions are generally still not strict enough and are mainly based on handling administrative violations making them less deterrent and educational. A group of people with high expertise in technology take an interest in exploring but lack their awareness of law, so they accidentally or intentionally illegally access the internet to exploit personal information for their own self-interests. The wiretapping of more than 14,000 mobile subscribers in 2015 is an example of this limitation.

On May 7, 2015, the People's Court in Hanoi brought the case of using software to wiretap to trial. Accordingly, Nguyen Viet Hung (born in 1974, residing in Khuong Dinh Ward, Thanh Xuan, Hanoi) - Deputy Director of Viet Hong Technology Co., Ltd. was prosecuted by the People's Procuracy of Hanoi for "Disseminating or illegally using information on computer networks, telecommunications networks, the Internet".

In 2015, information about a hacker group named DIE Group (identified in Vietnam) that attacked the website of a member unit of the Vietnam Posts and Telecommunications Group (VNPT) and disclosed tens of thousands of customers' bank accounts on the Facebook page of this group made many people confused and worried when important personal information such as full name, address, and phone number (both fixed and mobile) were easily accessed to infringe upon the legitimate rights and interests of citizens. Information about potential customers is for sale in almost every field from securities and real estate sectors to companies in industrial zones, NGOs, entrepreneurs, directors, accountants, customers of insurance companies, telco subscribers, fresh graduate students, etc., and even a list of parents from preschools.

Advertising and selling personal information of mobile phone subscribers are acts of violating the law, personal liberties, and privacy rights. Regarding sanctions, the acts of selling personal information of subscribers, depending on the level, can be administratively sanctioned with a fine between VND 50 million and 70 million or prosecuted for criminal liability in accordance with the 2015 Penal Code with a sentence of up to 7 years if the offence

falls into one of the following cases: organized crime, taking advantage of right to administer computer networks, telecommunications networks, or internet networks to gain illicit profits of one hundred million dong or more, or causing very serious or particularly serious consequences. However, the above-mentioned situations are still widespread, uncontrolled, and rampant due to difficulties in proving and sanctioning violations. Only when the origin of the data can be determined can there be a basis for handling violations. On the other hand, most cases of identity sale stop at the level of sharing personal contact (phone number, email, office or home address, etc.) to offer for sale. Additionally, very few people who have lost personal information sue for a variety of reasons. Therefore, the investigation and strict handling before the law have not been thoroughly deployed.

Shortcomings in privacy protection stem from the lack of a consistent and unified legal system, especially the lack of detailed and specific legal provisions. In particular, there is no implementation guidance on the protection of privacy or a private life for individuals, and even the concept and connotation of private life remain unclear. Therefore, this controversial and inconsistent legal issue leading to a gap in the application of the law needs awareness.

In fact, there are more and more cases of infringement of the right to correspondence, privacy, and personal secrets such as disclosing or leaking personal information of users from social networks like Facebook, YouTube, and Zalo, etc. Millions of user accounts have been attacked and their information has been stolen. However, the current legal system is not synchronous and effective and there is no mechanism to effectively protect personal information or family secrets of users who are Vietnamese citizens in the territory of Vietnam on cyberspace. Legal provisions on the protection of personal secrets of defendants, victims, and witnesses have not been concretized and are not strict enough. The mere fact that disclosure of information about victims, defendants, or witnesses is quite common and is exploited by the press and public leads to serious consequences for witnesses and their families. Disclosure of information about a crime can injure victims and witnesses, create discrimination against them and their families, and have a direct impact on their lives and their ability to reintegrate into society, thereby increasing the risk of violating rights to liberty and privacy.

One of the leading causes of limitations in the implementation of the law on the protection of these

rights is inconsistent awareness of the legislature and law enforcement, especially among levels, sectors, and academia, on privacy in our country at present. The lack of adequate awareness also directly affects the inconsistent, synchronous, and drastic action between sectors from central to local levels with regard to effective implementation as well as strengthening measures to protect these rights. Lack of support mechanisms for self-protection of personal information related to personal privacy, or handling skills in the situations regarding confidentiality protection, and personal information sharing in the digital economic environment or social networks are other causes.

2.4. Policy recommendations and ways forward

In order to further improve the implementation of an individual's rights to life, liberty, and personal security in time of COVID-19, as well as post-COVID-19, the following resolutions should be highly considered and upheld as follows: *Firstly*, further improving legal and policy system, especially revising some laws and legislation in order to better protect these rights. For example, the right to life in time of COVID-19 requires a better mechanism for protecting the right to life of every Vietnamese citizen and individual, especially the most vulnerable people such as women, children, elderly, disabled, and low income citizens, etc. In addition, some inadequate legal provisions related to health care and personal security need to be changed. Thus, there a new law on the protection of personal data in time of digitalization in order to protect better the personal security and liberty should be enacted. In addition to this, it is necessary to amend the 2015 Penal Code in order to criminalize cyber crimes as well as any breaches against personal security and liberty when taking advantage of the internet and a citizen's right to freedom of expression. *Secondly*, enhancing the capacity and competence of law and policy makers, in particular, and executors and officers in general, would ensure these rights. The 13th Party National Congress's Resolution sets the three breakthroughs of which the necessity of building developed institutions, especially a developed legal system, alongside developed human resource and infrastructure (especially digital one) are pre-conditions for achieving the ultimate goal of a civilized, democratic, just, and happy nation with human rights for all. *Thirdly*, further education,

propaganda, and information about the law, policies in general and human rights in particular, for both rights-holders (all stakeholders) and duty-bearers (public officials and civil servants) are essential. Human rights education must be provided and further strengthened in Vietnam's national universal educational system, especially for those training in the legal profession such as lawyers, judges, prosecutors, police officers, etc. *Fourthly*, further review is needed by an independent institution of the necessity of establishing a more effective and efficient mechanism for constitutional protection in particular, and to better protect human rights in general. At the same time, an independent institution of human rights such as a National Human Rights Commission or Ombudsman should be seriously reviewed for the establishment. In the present context of Vietnam, there should be an inter-commissional body established within the National Assembly's organs in order to supervise the implementation of human rights in general and the right to life, liberty, and personal security in particular. *Fifthly*, a more effective coordinative and collaborative mechanism for human rights protection among State and non-State organs or institutions, between national and local organs, must be established. *Sixthly*, further improving working institutions, as well as promoting, for the competence and role of mass media, mass organizations, or associations such as the Father's Front, Women's Union, Youth Union, the Association for the Protection and Care for Children, Lawyers' Association, Journalism Association, etc. should be accomplished. *Seventhly*, promotion of international cooperation in the fields of education, training, and sharing experiences in implementing the human rights in time of COVID-19 in the new context and a changing world is essential.

3. Conclusions

In short, the implementation of the rights to life, liberty, and personal security during the COVID-19 period in Vietnam has been remarkably improved and has obtained a lot of achievements. The Communist Party of Vietnam and the State of Vietnam have been adopting and implementing many new guidelines, policies, and laws to better guarantee human rights for all, especially the right to life, liberty, and personal security. Along with great efforts made in realising those rights in the time of COVID-19 over the past few years, Vietnam is beginning to fall in line with

the new context of in-depth international integration and rapid socio-economic development. However, there are still many obstacles and challenges to overcome to ensure these rights, which need to be carefully considered and taken seriously to improve the Vietnamese legal and policy framework, as well as implement and bring these rights into practice in the years to come. These obstacles and challenges are both objective and subjective resulting from the process of the nation's socio-economic development, international integration, as well as the recent changes in the regional and international context. Notably, there exists a range of issues that needs to be improved to ensure better human rights for all, such as i) the contradiction between the rapid growth of a socialist-oriented market economy with the higher demand of people in meeting national and international human rights standards; ii) the wider gap between the upper and mid-incomers and the poor, the rural and urban areas, modernisation and urbanisation with the conservation of cultural and national identity; iii) the incapacity of delivering the Party's policies and the State's law enforcement, especially at the local level; iv) the incompleteness of the national legal and policy frameworks; v) the improvement of establishing appropriate, effective mechanisms for power control and supervision in checking and balance amongst the state organs in fulfilling their own powers and duties in the implementation of human rights for all; vi) the inappropriate awareness of the law, human rights and the culture of human rights respect.

Thus, to better guarantee the human rights for all individuals, social groups and the entire society, the most and foremost priorities should be taken seriously as follows: 1) Much greater effort is needed for further improving the developed institution for the organisation and operation of the Party, the State and the entire political system, especially legal-administrative institutions; 2) Much greater attention made to educate and train advanced human resources who are capable of performing the law and policy in general, as well as that of human rights in particular, in the current context; 3) Much greater improvement of establishing an advanced technology and science, a developed infracostal system, etc. More importantly, there should be an appropriate shift in mindsets, thinking, and culture among politicians, leaders and managers, cadres, public and civil servants, about the essential role of strategic leadership and governance in law and policy making, implementation and supervision. In addition, there needs to raise awareness of human

rights, skills and culture for both the state organs, or the duties-bearers, and the people, or the rights-holders, based on international human rights law and national law, cultural identity and the nation's tradition.

CRediT author statement

Van Nghia Hoang: Conceptualisation, Methodology, Formal analysis, Writing, Editing; Thi Van Anh Pham: Data analysis.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

- [1] International Covenant on Civil and Political Rights (1966), <https://www.ohchr.org/en/instruments-mechanisms/instruments/international-covenant-civil-and-political-rights>, accessed 10 January 2022.
- [2] D.L. Chi (2021), "Freedom of movement in Vietnam in the context of COVID-19 pandemic", *Vietnam Law & Legal Forum*, <https://vietnamlawmagazine.vn/freedom-of-movement-in-vietnam-in-the-context-of-COVID-19-19-pandemic-37781.html>, accessed 19 March 2022.
- [3] Chairman of the Vietnamese National Assembly (2013), "Constitution Socialist Republic of Vietnam", <https://vietlaw.quochoi.vn/Pages/vbpq-toan-van.aspx?ItemID=26611>, accessed 21 March 2022 (in Vietnamese).
- [4] The Office of the High Commissioner for Human Rights (2018), *General Comment No. 36 on Article 6: Right to Life*, https://www.ohchr.org/sites/default/files/Documents/HRBodies/CCPR/GCArticle6/GCArticle6_EN.pdf, accessed 6 February 2022.
- [5] N.V. Hoan (2013), "Policy and law of Vietnam on the death penalty", *The Summary Record of Workshop on The Right to Life and The Death Penalty*, Institute of Public Policy and Law, Hanoi (in Vietnamese).
- [6] D.T. Dung (2015), "Right to privacy in the 2013 constitution and legal guarantees (P2)", *Journal on Information and Communications*, <http://www.tapchibcv.gov.vn/quyen-rieng-tu-trong-hien-phap-nam-2013-va-cac-bien-phap-bao-dam-bang-phap-luat-p2-4553-bcv.gov.vn>, accessed 26 September 2021 (in Vietnamese).
- [7] H.J. Steiner, P. Alston (1996), *International Human Rights in Context: Law, Politics, Morals: Text and Materials*, 1st edition, Rendon Press Oxford, 1286pp.
- [8] R.K.M. Smith (2022), *International Human Rights Law*, Oxford University Press, 528pp.
- [9] Q. Phong (2021), "Ensuring human rights during the Covid-19 'storm'", *Voice of Vietnam*, <https://vov.vn/chinh-tri/dam-bao-quyen-con-nguoi-trong-bao-covid-19-910601.vov>, accessed 10 May 2022 (in Vietnamese).

V MOST Journal of Social Sciences and Humanities (V MOST JOSSH): Manuscript Template

V MOST JOSSH mainly publishes original research and review articles which should provide a significant and substantial amount of new knowledge that can contribute to the existing theory or practice in the relevant field. The review articles should present a highly conceptual, intellectual, and in-depth analysis of an issue supported by a vigorous synthesis of relevant literature.

The structure of different types of articles may vary according to the type of study, and the content of the article.

The following are the detailed main components of the original research and review articles submitted to the journal.

Original research

The original research should have three following parts:

Preliminary section: it includes title, list of all contributing authors with their institutional affiliation, and abstract (160-250 words) with at least 3 keywords.

The title

List the author names separated by commas. Use superscript numbers to link affiliations, and symbols *†‡ for author notes. For example, X. Jones¹, P.Y. Smith^{1,2}

Author's affiliation addresses:

¹*Affiliations should be preceded by superscript numbers corresponding to the author list*

²*For any institutions, please provide the institution name, street, district, city, country*

Received ; revised ; accepted

Abstract:

Start your abstract here...

Keywords: keyword 1, keyword 2, keyword 3...

Classification number(s): 1.1, 2.2, 5.3, etc.

The abstract should range between 160 and 250 words and be structured in a single paragraph following keywords in a separate line. The abstract should represent the main part of the research manuscript. It should reflect a brief and comprehensive background following the aim of the study (main questions to be addressed), methods used for investigating the problem, a summary of significant findings, main conclusions, and implications of the results.

Keywords: they should come immediately after the abstract and contain 3-7 specific and relevant keywords. They should reflect the research study and the relevant field of research.

Classification numbers: depend on the Journal's Classification Scheme.

Author(s) are encouraged to write a "Highlights" that summarises the most exciting, interesting points from your manuscript.

Manuscript section: it is the main body of the scientific manuscript that consists of an introduction, purpose/objective of the study, research questions and/or hypotheses, literature review, research methods/methodology, results, discussion, suggestions/recommendations/implications/study limitations...(if any), and conclusions. These sections may slightly vary depending on the type of research approach and design used in the research. Each section should be numbered.

All of the Figures, Tables, and Equations should be cited in numerical order.

Figures

Fig. #: (Begin each figure caption with a label, "Fig. 1." for example, as a new paragraph).

Fig. 1. The figure caption should begin with an overall descriptive statement of the figure followed by additional text. They should be immediately after each figure. Figure parts are indicated with capital letters (A). If you prefer, you can place both the actual figures and captions logically through the text near where they are cited rather than at the end of the file (but not both). If a paragraph in the main text begins with the name of a figure, write out "Figure" in full (e.g., <para>"Figure 1 shows..."</para>).

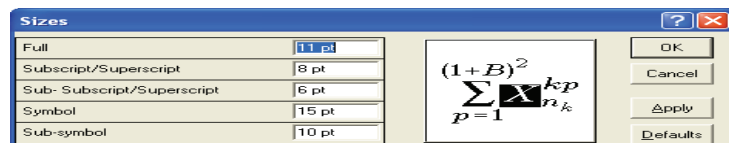


Fig. 1. The figure caption.

*Corresponding author(s): Email: Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.

Tables

Table #: (Begin each table caption with a label "Table 1.", etc.) as a new paragraph.

Table 1. Start this caption with a short description of your table. Format tables using the Word Table commands and structures. Do not create tables using spaces or tabs characters.

Table 1. Caption.				
a	b	c	d	e
f				
g				
h				

Equations

$$\int_a^b x dx \quad (1)$$

Closing section: it includes appendices/supplementary materials/data availability statement (if applicable), CRediT author statement (for multiple authors), acknowledgements (if applicable), competing interests, ethics (if any) and a complete list of references corresponding to all the citations given in the text of the manuscript. The appendices/supplementary materials may include data files and other material relevant to the research that should be submitted in separate files if required.

APPENDICES

The appendices should ideally be under 1000 words (approximately 2 A4 pages) for printing version. With longer appendices, they are only accepted for online publication.

CRediT author statement (for multiple authors)

CRediT offers authors the opportunity to share an accurate and detailed description of their diverse contributions to the published work.

ACKNOWLEDGEMENTS (if applicable)

This section is for the researchers who were funded for the research projects, and it should enclose all sources of financial support.

COMPETING INTERESTS

The author(s) declare(s) that there is no conflict of interest regarding the publication of this article.

REFERENCES

For in-text citation: References should be cited in the bracket with a number [1]. Multiple reference citations are separated by commas [2, 3] or if a series, dashes [4-6]. When citing sources with the author(s) and the year, they should be shortened to the first author's name, followed by et al. (with more than one author) and the year.

For reference list: With less than or equal to three authors, list all the author(s). With more than three authors, the first three should be listed and followed by et al.

References are listed in numerical order, and in the same order in which they are cited in text. The reference list should include all and only those references you have cited in the text. The reference list appears at the end of the article.

The reference consists of: Initial(s) and first/last name of the author(s), author' names separated by commas (Year of publication), "Titles of journal articles or chapter of book", Title of Journal, Book or Other Publication, Volume(Number) (if any), page numbers (if any), DOI (if any), URL and accessed date (if any) (in its original language if not English).

To cite a website and online/electronic resources, please include the accessed date (day month year).

Example of a reference list:

[1] D. Acemoglu, U. Akcigit, H.I. Alp, et al. (2018), "Innovation, reallocation and growth", *American Economic Review*, **108**(11), pp.3450-3491, DOI: 10.1257/aer.20130470.

[2] G. Dosi (2000), *Innovation, Organization and Economic Dynamics*, Edward Elgar, 720pp.

[3] Asia Program Area (1975), "The agricultural situation in the Far East and Oceania: Review of 1974 and outlook for 1975", *Foreign Agricultural Economic Report, No.105*, <https://ideas.repec.org/p/ags/uersfe/145966.html>, accessed 15 August 2022.

Review articles

They should be different from the original research as they would contain different sections on the literature review. Authors may structure this part as per nature, background, and available literature on the issue argued in the manuscript.

For more detailed instructions, please visit our website: d.vjst.vn or vmostscience.vn.

EDITORIAL BOARD

Editorial Board

Chairman

Nguyen Anh Dang (*Vietnam Academy of Social Sciences, Vietnam*)

Standing Members

Hong Tung Pham (*Institute of Vietnamese Studies and Development Science, VNU, Hanoi, Vietnam*)

Minh Khuong Vu (*National University of Singapore, Singapore*)

Tai Dong Nguyen (*Institute of Philosophy, Vietnam Academy of Social Sciences, Vietnam*)

Van Hy Luong (*University of Toronto, Canada*)

Members

Albert Pilot (*Utrecht University, Netherlands*)

Anil B. Deolalikar (*University of California Riverside, USA*)

Chu Hoi Nguyen (*University of Science, VNU, Hanoi, Vietnam*)

Duc Khuong Nguyen (*IPAG Business School, France*)

Hoai Son Bui (*Vietnam National Institute of Culture and Arts Studies, Vietnam*)

Hoang Minh Dang (*University of Education, VNU, Hanoi, Vietnam*)

João J. Vila-Chã (*Pontifical Gregorian University, Italy*)

Lutz Brangsch (*Rosa Luxemburg Stiftung, Germany*)

Minh Giang Vu (*VNU, Hanoi, Vietnam*)

Nhu Phuong Huynh (*University of Social Sciences and Humanities, VNU, Ho Chi Minh City, Vietnam*)

Peter C. Phan (*Georgetown University, USA*)

Quang Ngoc Nguyen (*Institute of Vietnamese Studies and Development Science, VNU, Hanoi, Vietnam*)

Quang Tuyen Tran (*VNU, Hanoi, Vietnam*)

Salvatore Barbones (*The University of Sydney, Australia*)

Thai Yen Huong Nguyen (*Diplomatic Academy of Vietnam, Vietnam*)

Thanh Tu Anh Vu (*Fulbright University, Vietnam*)

Thi Mai Nhan Tran (*University of Social Sciences and Humanities, VNU, Ho Chi Minh City, Vietnam*)

Thi Phuong Lan Ngo (*University of Social Sciences and Humanities, VNU, Ho Chi Minh City, Vietnam*)

Tho Dat Tran (*National Economics University, Hanoi, Vietnam*)

Tuan Cuong Nguyen (*Institute of Sino-Nom Studies, Vietnam*)

Van Nghia Hoang (*Ho Chi Minh National Academy of Politics, Vietnam*)

Van Sen Vo (*University of Social Sciences and Humanities, VNU, Ho Chi Minh City, Vietnam*)

Vu Hao Nguyen (*University of Social Sciences and Humanities, VNU, Hanoi, Vietnam*)

Editor-in-Chief

Nguyen Thi Huong Giang (*Ministry of Science and Technology, Vietnam*)

Managing Editors

Pham Thi Minh Nguyet (*Ministry of Science and Technology, Vietnam*)

Phi Cong Thuong (*Ministry of Science and Technology, Vietnam*)

Vu Van Hung (*Ministry of Science and Technology, Vietnam*)

Ninh Van Dien (*Ministry of Science and Technology, Vietnam*)

Le Thi Bac (*Ministry of Science and Technology, Vietnam*)

Tang Xuan Binh (*Ministry of Science and Technology, Vietnam*)

Doan Duc Khai (*Ministry of Science and Technology, Vietnam*)

Truong Thi Thao Duong (*Ministry of Science and Technology, Vietnam*)

EDITORIAL OFFICE

113 Tran Duy Hung Str., Cau Giay Dist., Hanoi, Vietnam

Tel: (84.24) 39436793; Fax: (84.24) 39436794

Email: vmostjossh@most.gov.vn; Website: d.vjst.vn or vmostscience.vn

PUBLICATION LICENCE

No. 459/GP-BTTTT 20th July 2021

No. 50/GP-BTTTT 1st February 2023