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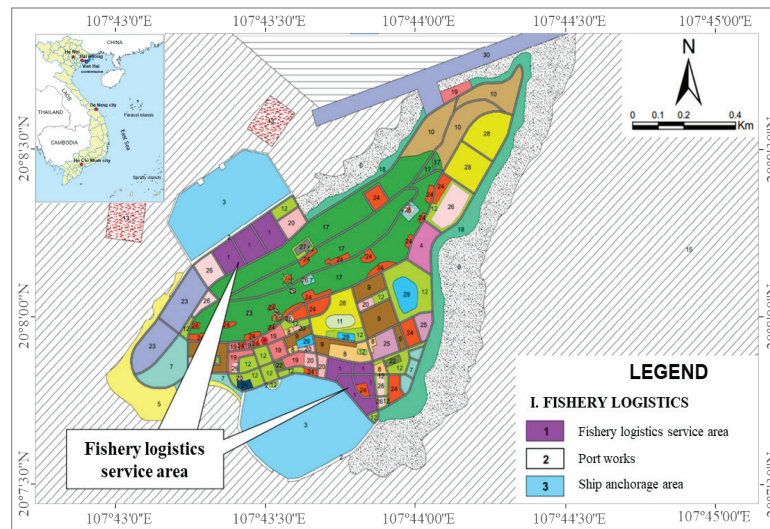
Humanities

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**

CONTENTS

DECEMBER 2023 • VOLUME 65 NUMBER 3

35



PSYCHOLOGY

3 National character in the view of psychoanalysis.

*Nguyen Quynh Huong,
Nguyen Vu Hao*

ECONOMICS AND BUSINESS

11 Mariculture development in Vietnam: Present status and prospects.

*Nguyen Van Quang,
Thai Thanh Binh,
Ngo The Anh*

21 Fruit and vegetable consumer preferences of Japanese and Vietnam's export potential.

*Nguyen Thi Thuy,
Tran Dinh Thao,
Tran Thi Thuong,
Dinh Cao Khue,
Dinh Gia Nghia*

31 Green economic model adapting to climate change and disaster prevention in Bach Long Vi island district, Hai Phong city.

*Xuan Sinh Le,
Van Bach Nguyen,
Thi Minh Hien Bui,
Manh Hao Do,
Van Thao Nguyen,
Thi Thu Ha Nguyen,
Van Tung Pham,
Truong Huynh Nguyen*

42 Application of decision analysis module in water resources allocation of inter-provincial river basins: A case study at the Bang Giang - Ky Cung river basin, Vietnam

*Hung Anh Nguyen,
Quoc Viet Tran,
Xuan Manh Trinh,
Duc Quy Luong*

51 A computational approach to transparency in corporate governance across borders.

*Wil Martens,
Diu Thi Huong Pham,
Justin Matthew Pang*

66 A model of entrepreneurial intention of graduates in the Mekong river delta.

*Tran Thi My Phuong,
Phan Anh Tu*

76 Smart factories: Literature review and development prospects.

*Tran Son Ninh,
Tran Doan Hieu,
Pham Thi Hoai Thu*

CONTENTS

DECEMBER 2023 • VOLUME 65 NUMBER 3

117



EDUCATIONAL SCIENCES

- 82** Librarians' professional development needs in the digital age - A case study at the Learning Resource Centre - Can Tho University, Vietnam.
*Huynh Thi Trang,
Nguyen Huynh Mai,
Huynh Nhat Duyen*
- 89** Factors affecting students' learning outcomes at the Faculty of Economics and Business Administration An Giang University.
*Tran Minh Hieu,
Nguyen Thanh Vinh,
Le Thi Ngoc Chuc,
Nguyen Ngoc Thao Ngan,
Phan Thanh Loc*

JURISPRUDENCE

- 99** ASEAN's soft law on marine environmental pollution.
*Hong Anh Do,
Thanh Vinh Pham,
Thi Thao Van Le,
Tuan Minh Vu,
Tuan Luong Truong,
Trung Hieu Nguyen,
Thi Thuy Lan Le,
Van Khanh Do, Thi Sanh Le*

OTHER SOCIAL SCIENCES

- 109** Sustainable tourism development and potential implications for the tourism sector in

the Vietnamese Mekong delta in the context of climate change.

*Huynh Van Da,
Truong Thi Kim Thuy,
Dao Vu Huong Giang,
Tran Trung Kien*

LINGUISTICS AND LITERATURE

- 120** Revealing the invisible: A phenomenological reading of N.B. Phuong's *The Absent* (1999) and W. Faulkner's *As I Lay Dying* (1930)
*Thi Van Anh Ho,
Thanh Nga Le*

National character in the view of psychoanalysis

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Abstract:

In the current context of globalization, alongside the prevailing trend, each nation-state still retains its distinctive national characteristics. These are the typical and unique features that each community contributes to the cultural heritage of humanity. In that sense, the character of each nation, expressing its identities and personalities, has always held a peculiar allure for researchers. However, national character is a rather nebulous concept, challenging to grasp, both relative and universal. Therefore, it remains an open concept, amenable to various approaches in psychology, sociology, ethnology, anthropology, value studies, and cultural studies. While psychoanalysis and national character may initially appear unrelated, national character is ultimately influenced by factors residing in the collective unconscious. Hence, if one seeks to discern the personality of a nation, psychoanalysis provides a promising avenue. From this perspective, the study of national character from a psychoanalytic standpoint can be considered quite unique and advantageous, deserving of attention. This article examines national character as a representation of a nation's unique identity from a fresh psychoanalytic perspective, offering insights into the national character of various nations, including Vietnam.

Keywords: anthropology, national character, psychoanalysis, psychology, social character.

Classification number: 1.1

1. Introduction

Globalization today raises numerous thought-provoking questions. Will the Lexus overshadow the Olive Branch to fashion a Flattened World? But what about a Flattened World from a cultural perspective? Perhaps, for an individual or a community, certain cultural layers may flatten or dissolve, but their identities and core essence shall endure. This represents the distinctive, individual contribution each human community makes to ethnic integration, thereby preserving cultural diversity within humanity. It is a profoundly human aspect of existence.

Nevertheless, for this preservation to occur, awareness among people is essential. Consequently, in recent decades, the matter of national character (national identity and personality) has received prominence on the agenda. Yet, national character remains an elusive and vague concept, simultaneously relative and universal. Thus, it stands as an open concept amenable to various

methodologies, including psychology, ethnology, ethology personality studies, and cultural studies. However, national character is akin to an iceberg, with only one-tenth visible above the surface, while the remaining nine-tenths lie submerged in the unconscious. Hence, exploring national character through the lens of psychoanalysis is a viable and promising approach.

2. What is psychoanalysis?

When discussing psychoanalysis, it is likely to mention the founder of psychoanalytic theory, S. Freud. Psychoanalysis emphasises the influence of the unconscious on behaviours. S. Freud (2018) [1] believed that human personality consists of three components: the Id, the Ego, and the Super-ego. The Id comprises primordial desires, while the Ego is tasked with facing reality. The Super-ego encompasses all the ideals and values absorbed from education, parents, and society. The interaction of these three components results in complex human behaviours, as the Ego constantly

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seeks ways to satisfy needs and desires while the Super-ego suppresses these urges, urging the Ego to act in accordance with moral standards dictated by cultural traditions, including customs.

Psychoanalyst E.H. Erikson (1977) [2] extended Freud's theory and underscored the crucial role of development in human life through the psychosocial stage theory of personality. Freud's psychoanalysis faced criticism for overemphasising the role of the unconscious, sexuality, aggression, and childhood experiences. Additionally, the claims made by psychoanalysts are challenging to verify, as most of Freud's ideas are derived from case studies and clinical observations rather than scientific, experimental studies.

3. National character

The concept of "national character" is referred to in some translated documents as "national character", "ethnicity", or "national personality". It pertains to the universal character representing individuals within a national category or nation. This concept is exemplified by two renowned cultural anthropologists, R. Benedict and Margaret Mead. The study of national character focuses on investigating the fundamental attitudes and values that are characteristic of a homogeneous society or a heterogeneous society comprising occupational groups, social classes, regions, domains, and ideologies.

R. Benedict authored the monograph "The Chrysanthemum and the Sword" (1946) about the Japanese personality, primarily based on secondary sources such as articles on Japanese life and interviews with Japanese immigrants in the US. Subsequently, a re-evaluation of her views revealed that most of her insights about the Japanese, including discipline, militarism, and aesthetic wisdom, were well-founded and accurate. These characteristics included being both rigid and adaptive, conservative, and open to new ideas. M. Mead, et al. (1953) [3] under the auspices of the American Tactical Operations Service (OSS), studied the national character of the British with the goal of elucidating the British personality while dispelling misunderstandings held by Americans about the British. The research, particularly on the role of fathers in the US and UK, shed light on the factors that encourage ostentatious attitudes in Americans and arrogance in Britons.

National character can be understood as the prominent features of a community sharing a common territory, language, way of life, and political rules over an extended period of history. National character is defined as "repeated characteristics that constitute the mental image of a nation", "Life within a shared territory, subject to the same historical influences and legal systems, generates common attitudes and characteristics, often referred to as national character" [4].

Nationality is both a theoretical and practical concept, not an amalgamation of two separate components - personality and ethnicity - but an intrinsic unity. Nationality is much like an iceberg, with only one-tenth visible to the conscious mind, while the remaining nine-tenths reside in the unconscious. Hence, an intriguing approach to understanding national character is through psychoanalysis.

4. National character from the perspective of psychoanalysis

Contemporary investigations into national character have been fundamentally guided by the psycho-cultural theory of national character. The central concept of personality has been employed as a model for defining the notion of national character.

Since 1942, in a publication by the British psychologist M. Ginsberg (1942) [5], emphasis has been placed on the ambiguity inherent in the concept of "national character" [5]. It can refer either to the entirety of the characteristics exhibited by each ethnic group as a whole or, at times, merely to a mode of distribution of fundamental behavioural traits that are distinctive to a particular group of people. This dual meaning aligns with two theoretical orientations, representing the two currents within the analysis of the Modern School of national character: *the anthropological and the socio-psychological*.

4.1. Psycho-anthropological models

The central idea propounded by the psycho-anthropological movement within the Margaret Mead School, comprised of cultural anthropologists and cultural psychoanalysts, posits that every national culture possesses a unique collective personality, a "typical personality". The various elements of this personality collectively determine the individuality of each member to varying degrees. The integrity

of the national culture and the coherence of the elements of national character constitute the two fundamental postulates of this analytical movement. In this sense, the psycho-anthropological approach to national character can be described as an “organic” holistic approach [6].

According to this perspective, the concept of national character is primarily defined as a structured set of collective personality traits, a foundational personality, a shared pattern that shapes the attitudes, ideas, opinions, behaviours, and cultural values of the ethnic group. It moulds the individual personality of each member. However, this general definition of the concept of national character encompasses two distinct concepts, two theoretical models derived from the two analytical pathways of the Anglo-Saxon School of anthropological psychology: the anthropological model and the psychoanalytic model.

4.2. The anthropological model “cultural personality”

Emerging from anthropological studies on personality within primitive societies, the notion of “cultural personality” serves as a theoretical model in anthropological examinations of the national character in contemporary complex societies. This concept can be seen as synthesising the two most significant cultural theories: R. Benedict’s configuration theory (1932) [7] and A. Kardiner’s (1939) [8] fundamental personality theory. *Firstly*, each society is perceived as an integral configuration, a whole governed by a shared pattern. *Secondly*, every society is characterised by a consistent cluster of psychological traits that reflect their adaptation to the natural environment and the type of upbringing received.

4.3. The psychoanalytic model “social personality”

Anthropological and psychological analyses of personality attempt to systematise society within culture or explore how to psychologically structure society’s internal elements. Anglo-Saxon culturalist psychoanalysts focusing on ethnic personality have underscored the significance of socio-historical factors and the role of socio-economic factors in shaping the collective personality of societies. The rationalising psychoanalysts, such as A. Kardiner and E. Fromm, define national character as a “social personality”.

E. Fromm (1994) [9], in particular, elucidated the foundations of psychoanalysis in socio-economic causality. He delved into the German national character through the lens of Nazism, offering explanations, both psychological and socio-economic, for the rise of fascism and its leader, Hitler. The central foundational concept in Erich Fromm’s social psychology research is the notion of “social character”. E. Fromm refers to social personality as a constellation of traits that form the core of most members’ personality structure within a group. These traits are shaped by the prevalent experiences, popular culture, and lifestyle of that particular group [9]. In essence, social personality represents a personality structure shared among group or community members, individuals within a society or a class, moulded by their way of life, along with common societal expectations and cultural conventions that necessitate behavioural adaptation. This adaptation arises from the interplay between the individual and their social and cultural milieu. Fromm utilises the concept of social personality as the key to comprehending and analysing an individual’s social process, as well as grasping the ethos of a culture.

E. Fromm elucidates the cohesiveness of social consciousness in terms of social character: “To ensure the smooth functioning of a given society, its members must acquire a personality type that motivates them to act as members of that society or a particular class within it. They must objectively wish to do so” [9]. In this context, social personality serves to align individual desires with societal needs, fostering a constellation of personality traits and cultural values assimilated by group members. In industrial societies, for instance, social character dictates that individuals adhere to the demands of work, emphasising discipline and punctuality. E. Fromm thus identified the personality structure of a modern worker in industrial society as characterised by compliance, discipline, and punctuality [9].

Similarly, D. Riesman’s examination of national character aligns with the perspective of cultural sociologists utilising E. Fromm’s psychoanalytic investigations into social personality [10]. In his seminal work in 1950, *The Lonely Crowd* [10], D. Riesman borrowed E. Fromm’s arguments on socialization and the theory of instilling social norms through “social character”. In this vein, he employed the term “national character” to encompass all facets of personality acquired through lifelong socialisation

and playing a pivotal role in sustaining these social structural attributes.

In essence, the organic concept of personality, from the psycho-anthropological standpoint, informs a comprehensive approach to understanding national character. Armed with the analytical tools of "cultural personality" and "social character", cultural anthropologists and psychoanalysts seek to apprehend the cultural personality of heterogeneous societies in their entirety, as well as the cultural compositions of contemporary great nations.

4.4. Psychosocial models

Derived from the fundamental culturalist hypothesis of personality, the research perspectives of the socio-psychological movement significantly diverge from those outlined by the psycho-anthropological movement.

Firstly, the socio-psychological analysis of national character is grounded in a concept of personality distinct from that developed in psycho-anthropological analysis. Psychologists and sociologists have adopted a statistical notion of personality, premised on the idea that multiple personality traits (and cultural patterns) exist within each ethnic group, in contrast to the holistic concept embraced by cultural anthropologists and psychoanalysts, positing a common personality shared by all members of an ethnic group, albeit with its own distinctiveness. Consequently, they have introduced the concept of a "unified personality," highlighting the interconnectedness of numerous personality traits.

Secondly, socio-psychological analysis of national character reveals two closely intertwined approaches. The personality of a social group is observed psycho-sociologically in two ways: as an object and as a subject, as both a social fact and an element of relatively stable existence. Additionally, the subject is perceived as a reflection of social reality. Thus, the socio-psychologist can discern personality within a set of attitudes and behaviours specific to the group under investigation, as well as a subjective reality within the consciousness of individuals belonging to the group. This subjective reality manifests itself in the form of social images and stereotypes.

Within this theoretical framework, we can gain insights into the distinct characteristics of various

global populations. To illustrate this, we will delve into the national character of a few ethnic groups.

5. National character in some countries

As cultures diversify in terms of lifestyle, customs, and other defining attributes, they contribute to the identity and character (identity, personality, and distinctiveness) of each nation. National character is a nebulous and elusive concept, both relative and universal. Perhaps it is one of the factors contributing to the diversity of national identities. It remains an open concept, amenable to various approaches: psychology, ethnography, ethology, anthropology, and cultural studies.

Every nation possesses a unique personality, where science and art can complement one another, and nothing is entirely right or wrong. Therefore, comprehending national character of various countries allows us to gain a holistic perspective. Through this intersection and overlap, we may discover a correct and lucid understanding of the intricacies of national character.

5.1. Russian national character

To grasp the essence of a nation, one must penetrate into its dreams-the epics, folklore, and poetry unique to that nation. However, these dreams vary greatly; they encompass both trivial, base, malevolent visions and lofty, sacred aspirations. Unlike national fairy tales, which poets often embellish with beauty and nobility, dreams remain unfiltered and authentic, reflecting the full spectrum of human experience, even the darkest corners of the psyche.

In a paper presented at a conference organized by the Italian Institute of Eastern Europe in November 1923 in Rome, and subsequently published in the *Journal Philosophical Problems* in June 1995, the renowned scholar B.P Vysheslavtsev [11] ventured to explore the Russian national character through an analysis of dreams. Everyone harbours desires, needs, and aspirations, but not all these desires are conscious; some lurk in the subconscious and unconscious mind. When we sleep, these desires, unguarded, escape into our dreams. However, even in dreams, these desires remain concealed, taking on the guise of magical images or narratives. This is the mental life of an individual. In the life of an ethnic group or a nation, collective dreams are consciously

and unconsciously woven into myths, fairy tales, and epics [11]. B.P. Vysheslavtsev identifies the essence of the Russian character as a riddle embedded in Russian fairy tales and epics, genres “forged over centuries that unveil the authentic, age-old spirit of the nation” [12].

Russian fairy tales and epics provide a realistic portrayal of the Russian character, highlighting its strengths and weaknesses, desires, and fears. One of these fears is the aversion to hard work, which, for Russians, can rival their fear of suffering. Russian folklore vividly illustrates what Russians fear most: poverty and, even more so, hard work. It seems as though suffering has a penchant for visiting, almost as if it were invited. A poor man, on his way home from a friend's house, found himself irritated and began to sing to ease his frustration. Although he sang alone, he heard two voices. He paused and inquired, “Are you mocking me, Suffering?” Suffering replied, “Indeed, sir, it is I”. “Very well, Suffering, let us go together”. “Certainly, sir, I shall not leave your side now”. And so, Suffering led his master from one hardship to another, from one tavern to the next. When he had squandered his last coin, the young man refused further indulgence. “No, Suffering, my reason prevails; I have nothing left to squander”. “Why do you say you have nothing left? Your wife still has two dresses—one to wear and one to exchange for wine”. The man exchanged the dress for wine and continued drinking. Later, he pondered, “This is absurd! My clothes are in tatters, and so is my wife's!” [12].

Consequently, Russians continually seek another life, another realm where strong wine flows freely and fat goats graze without the toil of labour. To obtain this “eternal bread”, they create wishful narratives, tap into “scientific wisdom,” seek the elusive “Milk of the Cows”, or chase after magical birds. They also strive for “public works” to reach these unfamiliar, distant realms. In pursuit of these dreams, Russians are willing to sacrifice their possessions, their neighbours, and even their own flesh and blood (as in the tale of the Magon bird). Prophecy, messianism, and idealism permeate Russian folklore. These elements are both the strength and weakness of the Russian character.

The Russian epic of heroes reveals another facet of the Russian personality. Russian knights represent the elite among the common people. Their hands defended the realm and the church, thwarting invasions by adversaries. However, if they felt slighted or were not invited to a certain gathering, they would vent their righteous indignation by demolishing the church they had built and protected, raining arrows upon the palace. The destructive potential of the populace is formidable whenever this instinct is aroused, as evidenced in riots and even revolutions [13].

Yet the Russian character also possesses an immeasurable love for beauty and wisdom, personified by the wise Vasilisa. Russian boys often dream of marrying her. Folklore suggests that living with her will bring happiness, while forgetting her will result in unhappiness. This love for Russian beauty also reflects a profound, melancholic affection for the vast and mysterious Russian landscape, cherishing souls as pure as a “silver plate”, not only in the gentle Russian maidens but also in the Russian men and the expanse of the cosmos.

In summary, spontaneity, a love for beauty, wisdom, suffering, God, holiness, as well as prophecy and idealism, are bold and prominent traits in the Russian character. These characteristics are deeply ingrained in the Russian way of life and are vividly expressed in the works of authors like Gogol and, notably, Dostoevsky. As the saying goes, “sow an action, reap a habit; sow a habit, reap a character; sow a character, reap a destiny”. The Russian character has shaped the destiny of Russia, as history has borne witness on numerous occasions when these dreams, as foretold in folklore, became reality. These are the defining attributes that constitute the Russian national character.

5.2. Japanese personality

When discussing Japan, one cannot ignore its remarkable achievements in economic and scientific development, deserving of admiration. These accomplishments are deeply rooted in Japanese culture, stemming from the national character of the Japanese people. According to research findings, the attributes of national character can be categorized based on the principle of “ethnic community - group of people - individual”.

5.2.1. *The ethnic community*

Japan exhibits national characteristics marked by a profound love for labour and fervour in all spheres of work-related activities. The Japanese engage in labour with selflessness and enthusiasm, and their inherent beauty shines through even in the process of working.

Japan possesses a unique word, “*furū*” (flowy), composed of two hieroglyphs: “*fu*”, signifying wind, and “*ryū*”, representing flowing water. This concept of “wind and flowing water” encapsulates aesthetics, which, according to the Japanese writer Tetsuzo Tanikawa, is the core characteristic of the Japanese nation. It forms the foundational trait around which all others gather [12].

Additionally, tradition, or rather the tradition, has profoundly influenced Japanese behaviour, thoughts, and aspirations, becoming a paramount feature of the nation's character. Traditions deeply rooted in Japanese society not only reflect the ideology of inheritance in social activities but also reinforce national, cultural, and life elements. The Japanese hold a reverent attitude towards their cultural heritage from the past, preserving classical theatrical arts, the tea ceremony, and the art of flower arrangement (*ikebana*). It is evident that, in contemporary Japan, great attention is given to tradition and ancient cultural artefacts. The Japanese exhibit a special reverence for established ways of life, as well as cultural heritage. Their attention extends not only to the substance of manners but also to the external expressions and mannerisms, resulting in unusually stable social conduct. The current state of Japan underscores the vitality of traditions in Japanese political thought and social behaviour. The traditional character of the Japanese profoundly influences many aspects of Japan's social and political activities.

5.2.2. *The behavioural characteristics of a group of people*

A “group of people” is defined as a collection of individuals based on various criteria such as age, occupation, gender, and so forth. Social psychology considers a group as an entity where individuals share a sense of belonging, albeit to varying degrees. The concept of a “group of people” functions as a “micro-environment” with distinct characteristics. This phenomenon holds true for any ethnic community, with the degree of solidarity being the distinguishing factor. In Japan, this level of solidarity is exceedingly high. Within the realm of Japanese group behaviour, discipline, loyalty to authority figures, and a strong sense of duty stand out prominently.

Group behavioural characteristics manifest through discipline, loyalty to authority, and a sense of duty. In Japanese interpersonal relationships, discipline is exemplified as a desire for harmony and adjustment. This characteristic necessitates strict adherence to established order, socially acceptable conduct, diligent fulfilment of duties, and genuine respect for superiors and elders.

The Japanese are renowned for their exceptional discipline. They show profound respect for rules and principles, not out of fear of punishment or other consequences, but rather out of a deep reverence for the law itself. This discipline is particularly evident in their commitment to queuing. Regardless of the context, whether purchasing everyday essentials or cutting-edge technology, orderliness prevails. The world admired the Japanese discipline during the earthquake and tsunami that struck the country in 2011 when, amid life-and-death situations, Japanese citizens maintained orderly queues to receive essential supplies [14].

Loyalty has also played a central role in Japanese culture. In the Tokugawa period, Japanese scholar Zoken Nishikawa wrote in his book *The Peasant Farm* (1721), “Because the lower classes lack the capability to govern the country, they have a duty to obey”. In 1879, Interior Minister Hirobumi Ito declared that “granting political judgement to the masses would spell disaster for the nation”. Submissiveness is rooted in fear of authority, including fear of the police, government officials, and the military. In Japanese thought, the government is seen as “something long and solid”. By nurturing the desire to rely on something “long and solid”, rulers have cultivated submission and obedience [12].

Submission to authority has become a defining feature of many Japanese individuals, forming the foundation of their unwritten code of conduct, which they adhere to meticulously. This code is consistently reinforced by a sense of duty, manifesting as the diligent fulfilment of personal responsibilities. All these principles are accompanied by intricate rituals that, in the present day, have adapted to new circumstances and hold a significant place in the hierarchy of human values, reflecting responsibility stemming from a sense of duty.

As a result, the centuries-old spirit of submissiveness has bestowed upon the Japanese a unique psychological disposition, akin to a source of gratification.

5.2.3. About personal characteristics

In terms of personal traits observed in daily life, individuals are expected to exhibit qualities such as politeness, punctuality, self-control, thrift, and curiosity [15].

Politeness stands as one of the paramount principles governing everyday life in Japanese culture, constituting a fundamental aspect of the Japanese way of life. Every word, gesture, and action of the Japanese people, no matter how routine, is imbued with politeness. For instance, even in situations where a small or moderately sized store appears to be unattended, with the salesperson perhaps concealed in a comfortable corner, a customer typically announces their presence with the phrase "Gomen kudasai" (Sorry!). Customers are encouraged to peruse the merchandise at their leisure, pose detailed inquiries, and unfailingly receive courteous responses. Prior to handling an item, it is customary for the Japanese to express apologies and seek permission from the proprietor. Polite discourse represents an unwavering fixture in Japanese communication, permeating all facets of interpersonal relationships in Japan.

5.3. Vietnamese national characteristics

Objective research into the personality traits of Vietnamese individuals is reflected in several works on Vietnamese psychology, culture, and history.

Research on the Vietnamese national character reveals the unity and mutual transformation of opposites. Key traits considered as traditional values among the Vietnamese people include a commitment to promoting collective and community spirit, an ethos of gratitude, and a strong disposition towards studiousness [16].

5.3.1. Respect of community

Respect of the community represents a fundamental and enduring trait within the Vietnamese national character. It serves as a cornerstone value in Vietnamese culture, underpinning the development of patriotism, national unity, solidarity, and collective consciousness. Given the perennial challenge of combating natural disasters, which afflict the region annually, as well as confronting foreign adversaries far superior in strength, community has played an integral role throughout Vietnamese history.

Vietnam, located in a region prone to numerous natural calamities such as floods, storms, and droughts, has faced irreparable damage and losses. Nevertheless, the response has consistently involved the spirit of "good leaves cover torn leaves" and the notion that "a sick horse leaves the whole ship to leave

the grass". Such expressions of communal solidarity are characterised by a readiness to aid and share the burdens of those in need within the same community. Vietnamese individuals exhibit a willingness to sacrifice personal interests and possessions for the greater good of the community and for the community, there are many practical actions showing noble gestures. It is a fact that, when facing a natural disaster, the Vietnamese people always offer assistance to those in areas affected by flash floods, enthusiastically contributing and supporting them with both material and spiritual support enveloped in the love for their compatriots.

In the face of war and foreign invasion, a recurring reality in Vietnam's history, the Vietnamese people, despite their relatively small size and limited resources, have relied on the unity of their collective spirit, deep-seated patriotism, and the pursuit of national sovereignty to resist foreign powers and fend off separatist ideologies and oppression. This unwavering solidarity has served as a potent weapon for building and safeguarding the nation. The essence of this unity is most vividly manifested in the modern era, particularly during the two resistance wars against the French and the Americans.

Vietnam's history is replete with instances where the spirit of collective solidarity and patriotism has endured despite considerable losses, sacrifices and deprivations of property and lives, and numerous hardships. This resilience has paved the way for the advancement of patriotism and a strong national spirit, ultimately thwarting the designs of brutal foreign invaders and their attempts at annexation. It is this solidarity and mutual assistance during difficulties that have become the starting point and the basis for the development of patriotism and national spirit of the Vietnamese people.

5.3.2. Respect of affection

The ethos of gratitude is a deeply ingrained attitude among the Vietnamese people, perpetuated through generations. To this day, elders regularly instil the importance of this tradition in the younger generation. The truth remains that even in contemporary Vietnamese society, which has embraced market mechanisms, this tradition continues to wield significant influence. It fosters communal cohesion, nurtures a harmonious, open, and compassionate way of life, and upholds the principles of "love people as if you love yourself", "a horse hurts the whole ship to leave the grass", "leaf leaves", and "heal torn leaves". However, it is essential to recognise that this value, like all others, carries both positive and negative aspects.

H.S. Quy (2006) [17] notes that the top value for the Vietnamese people is gratitude, but warns against overlooking its potential drawbacks, which are the disregard for morality and affection. This value carries inherent duality and, in many cases, it can still be valuable but outdated. Regarding the excessive veneration of gratitude, as expressed through proverbs such as “banana fish are immersed in their children”, “although they are different, they share the same truss”, “a drop of blood is thicker than a pond of water”, and “father’s bones and mother’s skin”, while often positive, may not hold true in all circumstances. The sentimental value placed on love, taken to extremes, possesses a dual nature. The positivity or negativity of this attitude hinges on the specific context. In the endeavour to construct a socialist rule-of-law state, idealistic perspectives that disregard constitutional law and regulations, notions like “the king’s law is inferior to the village’s rule” and “one hundred reasons do not equal a little love” become challenging to reconcile. Instead, they may lead to nepotism and a “descendant” mindset, contributing to disparities in the treatment and assessment of individuals. Furthermore, idealism may hinder scientific progress by discouraging critical thinking and the acceptance of scientific and revolutionary criticism, making it difficult for countries with this tradition to embrace such principles.

5.3.3. The spirit of learning

Vietnamese individuals are renowned for their studious spirit, coupled with an “innately intelligent” disposition and a longstanding educational tradition. Vietnam has produced numerous world-class scholars in various fields. Nevertheless, despite the recognition of the Vietnamese people’s dedication to learning, the country lags behind in terms of global recognition for its scientists, relative to other studious nations. Therefore, while the studiousness of the Vietnamese people possesses certain limitations and negative aspects, it is unequivocally regarded as one of the positive facets of their personality.

6. Conclusions

In conclusion, the intersection of ethnicity and psychoanalysis may appear unconventional at first glance, seemingly unrelated fields. However, a deeper exploration reveals that the national character is ultimately governed by elements residing within the collective unconscious. Consequently, approaching the study of national character through the perspective of psychoanalysis provides us with a comprehensive and multifaceted perspective.

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COMPETING INTERESTS

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

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Mariculture development in Vietnam: Present status and prospects

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Abstract:

Vietnam possesses significant potential for the development of mariculture, thanks to its extensive coastline and favourable natural conditions. However, the progress of the mariculture industry has lagged behind its potential. While land-based aquaculture expansion appears limited, mariculture development holds pivotal importance for the sustainable growth of Vietnam's aquaculture sector. This study aims to review the current status of mariculture in Vietnam, offer an analytical overview of the sector's potential and challenges, and provide recommendations and policy implications for its sustainable development. Secondary data from reliable sources and existing mariculture literature inform this study. It becomes evident that Vietnam's mariculture sector remains underdeveloped, with marine aquaculture activities primarily concentrated in nearshore areas. Small-scale production dominates, while large-scale and offshore production has not gained widespread prominence. The availability of production technology and logistic services for the mariculture sector remains limited. Various sources of risk, including disease outbreaks, environmental pollution, climate change, input quality, and rising prices, pose challenges to mariculture production. The study also introduces crucial recommendations for fostering the sustainable development of the mariculture industry in Vietnam.

Keywords: mariculture, small-scale, Vietnam.

Classification numbers: 2.1, 2.2

1. Introduction

Vietnam stands as one of the world's foremost aquaculture producers. In 2020, Vietnam ranked fourth globally in aquaculture production, with an output of 4.6 million tons [1]. Aquaculture represents one of the fastest-growing sectors, playing a vital role in Vietnam's socio-economic development. The industry offers employment opportunities to millions of Vietnamese, particularly in rural and coastal regions, and significantly contributes to food security and poverty alleviation. Annually, the fisheries sector, encompassing aquaculture and wild capture, accounts for 4-5% of Vietnam's GDP. Between 1995 and 2020, aquaculture production grew by a factor of 11, from 415 thousand tons to 4.6 million tons [2]. Notably, in 2022, Vietnam achieved a historic milestone, with seafood exports reaching an unprecedented 11 billion USD [3].

Aquaculture in Vietnam encompasses a variety of species, including freshwater, brackish water, and marine species. Commonly farmed species encompass fish (e.g., catfish, tilapia, carps, snakehead fish, marine finfish such as cobia, seabass, groupers), shrimp (white-leg shrimp, tiger shrimp), molluscs (oysters, clams), lobsters, seaweeds, and others. Of these, the use of sea water areas for aquaculture has been underutilised, while freshwater areas face limitations for expansion.

Vietnam, holds enormous potential for mariculture¹ development due to its 3,260-kilometer coastline spanning from North to South, a million square kilometres of Exclusive Economic Zone, over 3000 islands, and various bays, lagoons, and estuaries. Notably, land-based aquaculture

¹Here, mariculture means the farming of organisms for food or other products in the sea, in a marine water environment.

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expansion has been constrained. Furthermore, freshwater and brackish water fish farming can lead to environmental externalities such as eutrophication, disease outbreaks, antibiotic pollution, ecosystem degradation, and mangrove deforestation [4-6]. Conversely, offshore aquatic farming holds significant development potential. Mariculture has emerged as a vital industry in several countries worldwide, including Norway, China, and Australia [7, 8].

In recent years, Vietnam has enacted numerous policies, plans, and initiatives to promote mariculture development. Notably, the Central Committee of the Communist Party of Vietnam approved Resolution 36/NQ-TW on the sustainable development of the marine economy towards 2030, with a vision for 2045. This resolution identifies the development of sea-based aquaculture as one of the six economic sectors requiring substantial investment and promotion. On March 11, 2021, Decree 339/QĐ-TTg was issued, outlining plans for aquaculture development until 2020, with a vision extending to 2045. Additionally, on October 4, 2021, the Prime Minister introduced a Master Plan for aquaculture development at sea until 2030, with a vision extending to 2045. Despite substantial attention and support from both central and local governments and stakeholders, mariculture development remains limited compared to its potential. Production primarily remains at a small-scale level. The adoption of advanced technology across the farming, seed production, processing, and value chain stages remains constrained. The market for output and distribution networks appears unstable, while the allocation of sea water areas for farmers is time-consuming and challenging to implement in practice [9, 10].

To date, there has been a few studies that focuses on providing a thorough analysis of the mariculture sector in Vietnam, except a study done by N.V. Quang, et al. (2022) [11]. However, the study has limitations such as lacking up-to-date and detailed information as well as detailed analysis. This study, thus will overcome that limitation. The primary objectives of this study are to (i) Provide an overview of the current status of mariculture in Vietnam, (ii) Analyse the potential and challenges facing the seaculture sector in Vietnam; and (iii) Offer recommendations and policy implications for fostering the industry's sustainable development.

The subsequent sections of this article are structured as follows: Section 2 provides a global overview of mariculture. Section 3 outlines the key legal policies associated with the mariculture sector in Vietnam. Section 4 briefly presents the methodologies employed. Section 5 introduces essential information about marine aquaculture in Vietnam, while Section 6 concludes and offers recommendations.

2. Mariculture in the world

Aquaculture stands out as one of the world's fastest-growing industries in food animal production [12]. With the global population steadily on the rise, the expansion of land-based aquaculture has been constrained, while capture fisheries have exhibited stagnation over recent decades. Furthermore, the demand for seafood is on the upswing in tandem with increasing income levels. Therefore, the imperative of "farming at sea," or mariculture, becomes paramount in fulfilling the global human food demand [5].

Mariculture undeniably assumes a pivotal role in supporting coastal communities by providing protein-rich sustenance, elevating the incomes of coastal residents, generating livelihood opportunities for fish farmers, fostering regional economic development, and enhancing tourism in localities [13]. Over the past few decades, mariculture has been actively promoted and has experienced rapid growth, particularly in countries such as China, Norway, Chile, Canada, and the USA [5, 14-16]. Presently, a total of 112 countries and territories engage in seafood production within marine environments [17].

Since 1970, the production and economic worth of mariculture, encompassing marine and brackish areas, have witnessed a substantial surge [18]. In 2018, the combined output of mariculture and coastal aquaculture reached approximately 30.8 million tons, with a total value of USD 106.5 billion [15]. Over the past few decades, mariculture's contribution to global aquaculture production has significantly escalated, ascending from 14% in 2000 to 35.9% in 2016 [19].

The spectrum of organisms cultivated in mariculture encompasses fish, crustaceans, molluscs, seaweed, and various other marine aquatic species. As marine resources face depletion due to overexploitation, mariculture development emerges as an inexorable trend [20].

3. Legal policies for mariculture in Vietnam

This section delineates the legal framework and policies associated with mariculture development in Vietnam. While numerous legal documents exist, this section highlights several key documents profoundly relevant to marine aquaculture (Table 1).

Table 1. Main legal documents associated with the mariculture sector.

No.	Legal documents	Policies/directions
1	The Fisheries Law 2017, the National Assembly Law approved Law No 18/2017/QH14	- The People's Committee at the District level has the rights to allocate the use right of sea areas within 3 nautical miles to farmers whose livelihoods mainly depend on aquaculture. - The People's Committee at the Provincial level has rights to issue the use right of sea areas within 6 nautical miles for Vietnamese, organizations engaged in scientific and technological activities in aquaculture. - The Ministry of Natural Resources and Environment has the rights to issue the use right of sea areas beyond 6 nautical miles for Vietnamese, organizations conducting scientific and technological activities in aquaculture. - Mariculture activities must have an approved project by authorities, except for farmers whose livelihoods mainly come from aquaculture or farmers transitioning from marine capture to sea-based aquaculture.
2	Decision 339/QĐ-TTg issued on 11 March 2021 by the Prime Minister about approving the master plan for aquaculture development strategy until 2020 and a vision to 2045	- This plan encompasses the aquaculture industry, including mariculture. - Mariculture is promoted to evolve into a commercial industry. Large-scale production and offshore farming are encouraged to provide substantial output for exportation and domestic consumption.
3	Decision 1664/QĐ-TTg issued on 04 October 2021 by the Prime Minister about approving the plan for mariculture development until 2020 with a vision to 2045	- This plan specifically addresses the development of the mariculture industry. - The plan outlines both general and specific objectives for mariculture development until 2030, with a vision for 2045. - It also presents duties, actions, and solutions for mariculture development up to 2030, with a vision for 2045.
4	Resolution 36/NQ-TW by the Central Committee of the Communist Party on the sustainable development of the marine economy toward 2030 and with a vision to 2045	- The Resolution identifies sea-based aquaculture as one of the six economic sectors requiring promotion for rapid development.
5	Decree 11/2021/NĐ-CP issued on 10 February 2021 about regulating the assignment of certain sea areas to organizations and individuals for marine resource exploitation and utilisation	- This Decree governs the allocation of sea areas to individuals and organizations. Specifically, the People's Committee of each coastal district has the authority to allocate sea areas within 3 nautical miles to Vietnamese individuals for aquaculture purposes, with a limitation of 01 hectare for sea areas allocated to aquaculture farmers. The People's Committee of each coastal province has the authority to allocate sea areas within 6 nautical miles for individuals and organizations. The Ministry of Natural Resources and Environment has the authority to allocate sea areas beyond 6 nautical miles for marine users. - The maximum sea areas (within 3 nautical miles) allocated for individuals for aquaculture activities are limited to one hectare. - The maximum duration for the right to utilize the allocated sea areas is 30 years. However, the utilization right can be renewed for a total renewal period of less than 20 years.

4. Research methods

In this research, several methods were employed, including summary analysis, statistical analysis, literature review, and SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats). The study primarily relied on secondary data collected from reputable sources, such as the General Statistical Office (GSO), Directorate of Fisheries - Ministry of Agriculture and Rural Development (MARD), Vietnam Seaculture Association (VSA), Department of Fisheries in coastal provinces in Vietnam, as well as existing literature and prior research [11].

5. Present status of mariculture in Vietnam

5.1. The production of main marine species

Vietnam's seas and islands boast an array of biological resources, housing approximately 12,000 species of living organisms, and are acknowledged as one of the ten hubs of marine biodiversity regions [21].

Evidently, there has been a significant increase in both the farming areas and production output within the mariculture sector during the period spanning from 2010 to 2022. This upswing in both parameters suggests the expanding scope of the mariculture industry in Vietnam.

Mariculture species can be categorised into five groups, encompassing fish, lobster, crab, molluscs (oysters, clams, snails, and blood cockles), and seaweed. A detailed discussion of each species follows.

Marine fish species: This group is widely cultivated in nearly all coastal provinces in Vietnam. Common

Table 2. Farming areas and production volume of main farmed species.

No.	Main farmed species	2010	2012	2015	2017	2018	2019	2020	2021	2022
I Production areas										
1	Marine fish cage culture (1000 m ²)	-	-	-	-	2.980	3.425	3.390	3.375	3.372
2	Crab (1000 ha)	-	-	-	179	166	355	369	387	379
3	Lobster									
	- No of cage (1000 cages)	50	50	43	86	149	192	144	161	186
	- Measured in cubic (1000 m ³)	1.395	1.667	1.343	2.652	3.389	4.724	3.730	4.160	4.468
4	Molluscs (1000 ha)	26	31	41	41	54	54	53	51	61
5	Seaweed (1000 ha)	4	22	25	25	4	10	11	11	12
II Production quantity (1000 tons)										
1	Marine fish (1000 tons)	-	-	-	-	16	19	26	24	30
2	Crab (1000 tons)	-	-	-	-	47	49	56	61	62
3	Lobster (1000 tons)	2	2	1	2	2	3	3	3	3
4	Molluscs (1000 tons)	135	197	265	273	354	372	367	396	457
5	Seaweed (1000 tons)	19	18	63	102	110	120	135	138	145

Source: Directorate of Fisheries (2023) [22].

species include grouper, cobia, pompano, seabass, and red drum. Both the production area and quantity have experienced significant growth between 2010 and 2022. However, marine fish farming technology in Vietnam appears somewhat outdated, with many farmers relying on traditional technologies and materials for fish cages, such as wood and bamboo. Consequently, fish farming primarily takes place in nearshore areas, as cages constructed from traditional materials (wood and bamboo) are ill-equipped to withstand strong winds and waves in offshore locations. The adoption of advanced technologies in mariculture, such as the use of High-Density Polyethylene (HDPE) cages and Internet of Things (IoT) applications, remains limited. The feed for marine fish farming heavily relies on marine capture, particularly trash fish. Although industrial feed has been employed for certain fish species, such as pompano, cobia, and seabass, the number of fish farmers utilising industrial feed for their operations remains restricted.

Lobster: Lobster holds significant importance within Vietnam's mariculture sector, given its relatively high market value. The demand for this species is also substantial, both in local and international markets.

Lobster farming predominantly thrives in several central provinces, such as Quang Ngai, Phu Yen, Binh Dinh, Khanh Hoa, and Ninh Thuan. Particularly, Khanh Hoa and Phu Yen provinces collectively account for over 90% of the total production areas and the value of lobster production in Vietnam. This is attributed to the presence of favourable natural resources conducive to lobster farming in these provinces.

As depicted in Table 2, the number of lobster cages witnessed a rapid increase between 2010 and 2022. In 2010, there were 50 thousand lobster cages (equating to approximately 1.4 million m³); this figure quadrupled over nine years, escalating from 50 thousand cages to 186 thousand cages (approximately 4.5 million m³). However, the quantity of lobster production only increased by 1.5 times during this period, implying a decrease in productivity between 2010 and 2022. The decline in production can be attributed to factors such as disease outbreaks, notably milky disease, which occurred during those years [23].

Molluscs: Mollusc species find cultivation in numerous coastal provinces across Vietnam, encompassing around 28 provinces [24]. Common species include oysters, clams, snails, mussels, blood cockles, shells, geoduck clams, and others. Each province possesses its unique potential and favourable conditions for these species. In 2019, the total production areas for molluscs spanned about 61 thousand hectares, yielding a production volume of 457 thousand tons. Notably, oyster and clam farming areas accounted for approximately 30% of the total mollusc farming areas, while the production volume of oysters and clams contributed to 67% of the total mollusc production volume.

Clam farming has been established in several provinces, including Hai Phong, Thai Binh, Nam Dinh, Ninh Binh, Thanh Hoa, and a selection of southern provinces such as Tien Giang, Ben Tre, and Tra Vinh. Conversely, oyster cultivation has flourished in regions such as Quang Ninh, Hai Phong, Nghe An, Thua Thien Hue, Khanh Hoa, Ba Ria - Vung Tau, and Ca Mau. Other mollusc species, including abalone, blood cockle, geoduck clam, and snail, have found cultivation in coastal areas with favourable natural conditions. For instance, abalone and geoduck clams are cultivated in Quang Ninh, Khanh Hoa, and Kien Giang, while snail species are commonly farmed in Quang Ninh, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, and Ninh Thuan.

Seaweed: Vietnam boasts more than 800 types of seaweeds, with over 90 species of significant value. Some seaweeds, such as sea grape, *Gracilaria verrucosa*, and cartilage seaweed [25], hold high economic value. Between 2010 and 2022, seaweed production volumes experienced remarkable growth. Specifically, seaweed production surged from 19 thousand tons in 2010 to 145,000 tons in 2022, marking a sevenfold increase [26].

5.2. Mariculture areas

Marine aquaculture is prevalent across all 28 coastal provinces spanning from the northern to the southern regions of Vietnam. Nonetheless, the mariculture sector exhibits concentration in specific areas and provinces. For instance, northern provinces like Quang Ninh, Hai Phong, Thai Binh, and Nam Dinh engage in mariculture, as do central provinces including Thanh Hoa, Nghe An, Phu Yen, and Khanh Hoa, alongside several southern provinces such as Ba Ria-Vung Tau, Tien Giang, Ben Tre, Ca Mau, and Kien Giang. Each province possesses distinct advantages and favourable conditions for mariculture development. Certain provinces excel in marine fish farming, such as Quang Ninh and Ba Ria-Vung Tau, while others, like Tra Vinh and Ca Mau, shine in crab farming. Similarly, Phu Yen and Khanh Hoa have gained recognition for lobster farming, whereas mollusc farming thrives in Quang Ninh and Kien Giang.

Concerning sea-based farming areas, mariculture activities are categorised into three area groups: within 3 nautical miles, between 3 and 6 nautical miles, and beyond 6 nautical miles. Nevertheless, the majority of mariculture activities are conducted in nearshore areas (within <3 nautical miles) utilising traditional technology, such as wooden cages and frames. Conversely, mariculture in offshore areas (>6 nautical miles) remains relatively limited. For instance, in 2019, there were 6,506 mariculture producers (encompassing marine fish, lobster, and other marine species) operating within 3 nautical miles, while 914 fish mariculture producers operated between 3 and 6 nautical miles. However, only 27 fish seaculture producers managed farms in offshore areas (beyond 6 nautical miles) [27].

The concentration of mariculture cages in coastal regions has led to a high density of farming activities, giving rise to growing concerns about

pollution stemming from aquaculture operations. Accumulation of discarded nutrients from uneaten feed, faeces, and waste from farming activities can pose a threat to the seabed and benthic ecosystems [28]. This accumulation may result in damage to benthic ecosystems and, at times, lead to algal blooms [29], subsequently impacting farming activities, including disease outbreaks and oxygen shortages in farming areas. Furthermore, aquaculture in nearshore areas may encounter various challenges and risks, such as environmental pollution from other economic activities (e.g., mining, construction, tourism, industrial and residential water discharge), and potential conflicts with other sea-based economic activities (tourism, transportation, mining, marine capture, wind power, etc.). A notable example of coastal environmental pollution due to industrial activities occurred in 2016 when the Formosa Ha Tinh Steel Corporation illegally discharged wastewater into the sea, causing extensive adverse effects on the natural environment, socioeconomic development, livelihoods, and other economic activities (including marine aquaculture) in the surrounding areas [30].

Offshore mariculture offers the potential for increased seafood production while mitigating pressure on coastal ecosystems [31]. Fish farming in offshore areas can help mitigate the impact of onshore economic activities on farming, reducing negative environmental repercussions [32]. However, offshore fish farming also presents challenges, including substantial investment costs, the necessity for advanced technology and skilled labour, and risks associated with safety at sea, adverse weather conditions, waves, currents, and security [32, 33]. Consequently, only a limited number of seaculture producers have ventured into offshore farming, with a mere 27 farmers and organisations operating mariculture in offshore areas [22].

To stimulate offshore fish farming activities, the government must institute appropriate policies and provide support mechanisms, such as financial and technological assistance, to incentivise farmers, organisations, and enterprises to invest in offshore seaculture. Moreover, marine spatial planning and marine aquaculture planning are imperative to foster the development of mariculture in Vietnam.

Table 3 presents the farming area and production output in coastal provinces in Vietnam.

Table 3. Production areas and production output of some main marine species in 28 provinces/cities in 2022.

No	Province	Farming areas of main species					Production output volume (tons)				
		Total production areas (ha)	Marine fish cage (m ²)	Crab (ha)	Lobster (m ²)	Molluscs (ha)	Total production	Marine fish cage	Crab	Lobster	Molluscs
1	Quang Ninh	27.794	391.554	7.000	0	9.500	54.192	8.747	1.034	0	38.393
2	Hai Phong	5.130	51.000	260	0	2.400	46.935	0	250	0	46.500
3	Thai Binh	6.726	0	2.296	0	3.169	124.245	0	1.307	0	120.902
4	Nam Dinh	5.580	0	1.365	0	2.350	57.490	0	1.240	0	45.300
5	Ninh Binh	3.330	0	2.000	0	1.300	26.210	0	740	0	24.500
6	Thanh Hoa	5.290	41.000	3.450	0	1.140	20.950	800	750	0	18.000
7	Nghe An	278	10.000	25	0	163	5.042	0	0	0	4.588
8	Ha Tinh	610	8.256	36	0	422	3.566	29	0	0	3.213
9	Quang Binh	301	23.227	241	0	16	480	195	172	0	68
10	Quang Tri	71	313	0	0	27	499	89	0	0	337
11	Thua Thien Hue	5.081	75.336	693	0	0	4.456	1.256	0	0	1.145
12	Da Nang	-	-	-	-	-	-	-	-	-	-
13	Quang Nam	107	252.000	27	0	25	3.510	3.300	15	0	60
14	Quang Ngai	108	155.000	10	0	75	2.624	556	7	0	1.921
15	Binh Dinh	2.765	42.270	1.368	14.700	29	1.367	187	55	30	616
16	Phu Yen	873	2.085	286	1.488.767	68	4.484	990	0	1.750	0
17	Khanh Hoa	1.372	495.424	297	2.795.844	629	16.031	8.173	34	1.376	4.405
18	Ninh Thuan	89	32.400	0	79.200	31	2.448	532	0	140	1.307
19	Binh Thuan	11	104.479	0	5.058	10	808	504	0	12	280
20	Ba Ria-Vung Tau	992	1.383.840	0	84.000	568	6.712	1.112	0	140	4.912
21	Ho Chi Minh city	985	2.000	0	0	985	22.441	120	0	0	22.321
22	Tien Giang	2.375	0	0	0	2.320	19.920	0	0	0	18.570
23	Ben Tre	5.200	0	0	0	5.200	18.357	0	0	0	14.900
24	Tra Vinh	24.280	0	23.700	0	580	9.662	0	6.603	0	3.059
25	Soc Trang	1.851	0	1.728	0	0	2.593	0	1.425	0	0
26	Bac Lieu	950	0	0	0	950	6.270	0	0	0	6.270
27	Ca Mau	259.410	10.000	252.000	0	7.410	25.202	250	24.000	0	952
28	Kien Giang	104.178	292.300	82.081	0	22.097	102.432	3.372	24.444	0	74.616
Total		465.735	3.372.484	378.863	4.467.569	61.464	588.925	30.212	62.076	3.448	457.134

Source: Directorate of Fisheries (2023) [22].

5.3. Technology and supporting logistics services in mariculture

The technology employed in mariculture in Vietnam is generally underdeveloped and outdated, with limited utilisation of advanced technology and industrial-scale production. Traditional technology remains prevalent among most farmers. For instance, bamboo, wood materials, and foam floats are commonly used to construct fish cages, whereas the use of HDPE cages is infrequent. Farming operations predominantly occur on a small scale at the household level. The vulnerability of bamboo, wood, and foam float cages to natural disasters and

environmental challenges, such as strong waves, wind, and storms, is evident. An illustrative example is the devastating impact of typhoon Damrey in 2017 on the Central region of Vietnam, resulting in extensive damage to nearly all seaculture cages and significant losses for fish farmers. Furthermore, farmers' attitudes and compliance with instructions and regulations regarding fish density, environmental protection, and cage placement have been limited. The density of fish cages in some coastal areas has been overcrowded and exceeded its carrying capacity, leading to environmental pollution, disease outbreaks, and ecosystem disturbances [10, 34].

Seed production and supply: In 2022, Vietnam held 71 marine fish hatcheries, primarily concentrated in the northern and central regions of the country. Successful artificial seed production has been achieved for various marine-farmed fish species in Vietnam, including grouper, cobia, pompano, red drum, and seabass. Additionally, there were 706 hatcheries for molluscs and 325 hatcheries for crabs [22]. However, lobster seed is entirely reliant on wild sources, either harvested from Vietnam's sea areas or imported from foreign countries. While seed crab was previously sourced from the wild, it is now available to farmers through artificial production.

Despite recent advancements in breeding technology and artificial production in mariculture, some limitations persist. During peak seasons, the supply of seed often falls short of fish farmers' demand, necessitating imports. However, these imports largely occur outside official quotas, posing challenges in terms of quality, disease control, biosecurity, and quantity regulation. Furthermore, concerns linger over the quality of seed for marine aquaculture due to limitations in broodstock sources and breeding technology within the mariculture sector.

Feed for the mariculture industry: Two primary types of feed are utilised in the seaculture industry: industrial feed and natural feed, such as trash fish. Trash fish is more commonly used than industrial feed, particularly in lobster farming (where 100% of the feed consists of trash fish). Relying on captured trash fish for mariculture contributes to the depletion of marine resources and overexploitation of fish stocks, culminating in unsustainable development and environmental issues. Additionally, fish farmers encounter difficulties in managing their feeding operations when heavily dependent on trash fish. This dependence becomes apparent when adverse weather conditions, such as typhoons, strong currents, or high winds, impede fishing, resulting in a shortage of trash fish. While industrial feed has been adopted by farmers for several marine fish species, such as pompano, seabass, and red drum, challenges persist in this domain.

Regarding industrial feed, Vietnam houses 23 aquafeed mills offering 150 products [22]. Most of these mills are foreign direct investment (FDI) or joint venture companies, importing feed ingredients, primarily soybeans and fishmeal, from international markets. This heavy reliance on imported inputs for the aquafeed industry poses various concerns and challenges for the mariculture sector, including quality control, escalating input prices, traceability issues, market monopolies, and price fluctuations.

Given that feed costs constitute a substantial portion of the total production expenses in the mariculture [35], the industry faces multiple risks when heavily relying on imported feed or feed ingredients.

Workforce in the mariculture sector: The fisheries industry, inclusive of the mariculture sector, employs over 4 million individuals (VASEP, 2020). In this context, most farmers rely on their personal experience and knowledge for farming operations. The workforce in the sector exhibits limitations in terms of education level, farming management, environmental consciousness, and technology adoption [36]. Skilled labour is imperative for mariculture, especially in offshore farming; however, a shortage of skilled labour exists in this domain [37].

Several universities, colleges, and institutes offer courses and programmes related to aquaculture. Regrettably, none of these institutions provide educational programmes specifically tailored to industrial mariculture [38].

5.4. Output market

The market for mariculture output exhibits diversity, encompassing both international and domestic markets. The demand for mariculture products is often influenced by the product type (e.g., processed or live fish) and the specific marine species. For instance, live and fresh fish species enjoy popularity in the domestic market and are also exported to China through unofficial channels. Marine fish species, on the other hand, are exported to the EU and the USA as frozen products.

For mollusc species: Vietnamese mollusc products are exported to 42 countries, as reported by the Vietnam Association of Seafood Exporters and Producers in 2022 [39]. Notably, the export value of molluscs has shown steady growth over recent years. The primary markets for Vietnamese molluscs include the EU, which accounts for approximately 62% of the total export value, followed by the USA at 12%, as well as Korea, China, and ASEAN countries. Specifically, in 2021, the total export value of molluscs reached US\$ 141.6 million [39].

Lobster: Lobsters are traded in both domestic and international markets. Live lobsters are frequently exported to various countries. However, the largest market for live lobsters is China, where it constitutes 90% of the total quantity of Vietnamese lobster exports. A smaller proportion of lobsters is sold within Vietnam, primarily targeting high-end hotels and restaurants in major cities. Annually, the quantity of lobster exported amounts to approximately 2-3

thousand tons, with the total production value of lobster farming reaching about US\$ 120 million per year [40].

Crab and sentinel crab: Crab and sentinel crab primarily find their main markets in domestic and Chinese markets. A small quantity of crab and sentinel crab is processed into crab meat and exported to international markets.

Seaweed species: Seaweed species have a versatile range of uses. Several Vietnamese seaweed species serve as food and feed for humans and animals, as well as materials for other industries such as cosmetics and traditional medicine production. Vietnamese seaweed species are sold both in domestic and international markets.

While the export value of seaculture products has shown growth in recent years, it remains relatively modest. China's market continues to be the primary destination, particularly for fish and lobster exports, with seaculture products primarily reaching China through unofficial quotas. Although other markets such as the EU, Japan, and the US are important, the export value to these regions remains limited. Additionally, these markets often demand high-quality products meeting stringent standards, including traceability, safety and hygiene, responsible farming practices, and eco-labelling. Therefore, expanding international markets for mariculture products necessitates the adoption of international standards within the mariculture industry.

5.5. Value chain of mariculture sector

There has been limited collaboration among various stakeholders within the mariculture industry's value chain. This lack of cooperation stems from the fact that seaculture production is predominantly household-based and small-scale. Moreover, many marine species are mostly exported through unofficial quotas, and the distribution network relies heavily on intermediaries. In the processing sector, there has been limited application of cutting-edge technologies. Although various products, including fish oil, oyster oil, dietary supplements, cosmetics, and pharmaceuticals, have been produced, advancements in processing technology and value addition in manufacturing have been relatively limited. Transitioning from small-scale to large-scale and industrial production is imperative to foster greater cooperation among participants along the mariculture value chain.

5.6. Opportunities and challenges for the mariculture industry in Vietnam

The development of mariculture in Vietnam is associated with both opportunities and challenges, as outlined in Table 4. Notably, the favourable environmental conditions present one of mariculture's significant advantages. Conversely, challenges can be categorised into several groups, including outdated technology across mariculture stages (from breeding and seed production to farming, processing, and distribution), the supporting industry, and logistical services for mariculture. The allocation of marine area usage rights to fish farmers under existing legal frameworks also presents a barrier to the industry's growth [11].

Table 4. Main opportunities and challenges of mariculture sector.

Opportunities	Challenges and obstacles
- Abundant natural resources and favourable conditions for mariculture development, including extensive sea areas, islands, and bays. - A lengthy coastline spanning 3,260 km, encompassing 28 coastal provinces. These provinces collectively account for over 50% of Vietnam's population, offering potential markets and a source of labour for various aquaculture activities, including farming, processing, and logistical services. - Increasing demand for seafood, driven by rising incomes in both global and domestic markets. - Access to the high-demand seafood market in China, one of the largest seafood consumers globally. - Growing global recognition of mariculture's importance, with significant support and attention from both central and local governments. The sector is identified as a crucial component of Vietnam's ocean economy.	- Lack of comprehensive sea aquaculture planning and spatial marine planning at the local government level, leading to conflicts and overlapping among sea area users. - Complex and time-consuming allocation of usage rights for marine areas to fish farmers. - Concentration of mariculture activities in coastal areas. - Limited mariculture technologies, with small-scale production prevailing. The adoption of advanced technology and large-scale production remains limited. - Shortage of skilled labour in the mariculture sector. - Scarce, weak, and underdeveloped supporting and logistical services in the mariculture industry. - Growing environmental concerns, including issues such as plastic pollution, disease outbreaks, and ecosystem imbalances, associated with mariculture. - High investment costs, particularly for offshore mariculture. Additionally, mariculture at sea is exposed to significant risks, including those related to climate change, storms, diseases, and price volatility for inputs and outputs. Supportive policies from authorities have been limited in addressing these challenges.

6. Conclusions

Vietnam, with its extensive coastline spanning over 3,260 kilometres and numerous islands and bays, possesses the ideal conditions for the development of mariculture. While the mariculture sector has shown substantial growth in recent years and has made significant contributions to the national economy, its potential remains largely untapped. The mariculture industry in Vietnam is still in its infancy and emerging stages, primarily concentrated in coastal regions, with limited offshore operations and predominantly small-scale, unorganized production.

Despite its potential, the mariculture sector faces several challenges that hinder its sustainable development. The adoption of advanced technology and cutting-edge practices in mariculture remains limited. Insufficient development of logistical services and supporting industries further impedes the sector's progress. Mariculture farmers contend with multiple risks, including climate change, disease outbreaks, volatile markets, environmental degradation, credit constraints, and various complexities.

To achieve sustainable development in mariculture, a range of policies and strategies must be promoted and implemented. Mariculture zoning and maritime spatial planning are crucial to prevent conflicts between sea activities, and the allocation of sea areas to fish farmers or organizations is a key challenge that needs to be addressed. Removing these constraints will provide partial encouragement and support for the industry's development.

Investment in high-tech solutions and scientific research for the mariculture sector should be encouraged and prioritized, given the limited adoption of advanced technologies. Workforce training is essential, particularly as the transition from small-scale to industrial-scale aquaculture models necessitates a highly skilled and experienced workforce. Collaboration in production, such as value chain-based production models, cooperatives, and groups, should be promoted and government-supported.

Furthermore, investment and credit programs should be established to incentivize farmers and businesses to invest in the mariculture sector, particularly in offshore areas. Investments should encompass breeding and hatchery operations, mariculture technology, processing and distribution, logistical and support services, and infrastructure

development for mariculture activities, including seaports, markets, security, weather monitoring, and environmental observation stations. These measures, when implemented effectively, will help unlock the full potential of Vietnam's mariculture industry and contribute significantly to its sustainable growth and economic development.

CRedit author statement

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COMPETING INTERESTS

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

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Fruit and vegetable consumer preferences of Japanese and Vietnam's export potential

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Abstract:

This study analyses consumer preferences of the Japanese for vegetables and fruits using secondary data. Additionally, to analyse Vietnam's potential export of fruits and vegetables, this study interviewed 53 Japanese consumers. The Japanese have long embraced a healthy lifestyle. Eighty percent of the Japanese participants in the survey consume fruit and vegetable products daily or 2-3 times a week. They have a wide range of places from which to purchase vegetables and fruits. From the perspective of Japanese consumers, Vietnamese fruit and vegetable products are more diverse and cheaper than those from the US, China, Thailand, etc. However, their quality is perceived to be inferior to that of these countries. The total value of Vietnamese fruit and vegetable exports to the Japanese market is quite modest, representing less than 2%. Therefore, to promote the export of Vietnamese vegetables and fruits to the Japanese market, Vietnamese enterprises should undertake the following activities simultaneously: (i) Establish an import market assessment room/centre in each Vietnamese exporting enterprise; (ii) Conduct an in-depth market study of fruit and vegetables in Japan; (iii) Improve understanding of consumer culture in Japan; (iv) Ensure quality of exported fruits and vegetables; and (v) Enhance trade promotion activities.

Keywords: fruit and vegetable, Japan, Vietnam.

Classification numbers: 2.1, 4.1

1. Introduction

Japan is an island nation faced with challenging natural conditions due to its predominantly mountainous terrain. The climate is severe, and the country frequently experiences natural disasters such as earthquakes, tsunamis, and volcanic eruptions. These challenges have hampered the development of Japan's agriculture industry, including fruit and vegetable production. As a result, current domestic fruit and vegetable production in Japan can only fulfil about 70-80% of the nation's consumption needs; the remainder is met through imports. This situation presents an opportunity for Vietnamese fruit and vegetable exporters to tap into the Japanese market.

Vietnam is the third-largest fruit and vegetable exporter in the ASEAN region, following the Philippines

and Thailand [1]. Over the years, Vietnam's rate of fruit and vegetable exports has seen significant growth. While the growth rate was 32.2% over the five-year period from 2011 to 2016, it rose to 42.4% by the end of 2017. Notably, the export turnover reached 3.81 billion USD in 2018, a 4.85% increase compared to 2017 [2].

Vietnam exports fruit and vegetable products to numerous countries and regions. Apart from traditional markets like China, ASEAN, and Russia, Vietnamese fruits and vegetables have made inroads into more challenging markets such as the US, EU, and Japan. Although Japan consistently ranks within Vietnam's top five fruit and vegetable export destinations [2] and is viewed as a target market, the total value of Vietnamese fruit and vegetable exports to this market remains relatively

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modest, at less than 2%. Hence, to boost the export value of Vietnamese fruits and vegetables to the Japanese market, it's imperative for Vietnamese exporters to understand the preferences of Japanese consumers, particularly with regard to produce from Vietnam. This article aims to analyse the general preferences of Japanese consumers for vegetables and fruits, delve deeper into their perspectives on produce originating from Vietnam, and subsequently suggest strategies to enhance fruit and vegetable exports to the Japanese market in upcoming years.

2. Literature review

The topic of exporting Vietnam's agricultural products, particularly vegetables, and the associated competitive and commercial advantages, has garnered significant attention from domestic researchers, from micro to macro levels. Several studies highlight the importance of promoting trade and bolstering Vietnam's agricultural exports to fully exploit the country's competitive and comparative strengths [3-9].

The study "Exporting fruits and vegetables from Vietnam to the Japanese market" employed descriptive statistics based on secondary data. The findings suggest that the ASEAN-Japan Comprehensive Economic Partnership Agreement has played a role in alleviating tariff barriers linked to Vietnam's agricultural potential. However, technological challenges have resulted in a minimal market share for Vietnam's fruits and vegetables in Japan. Obstacles to exporting Vietnamese fruits and vegetables to the Japanese market encompass: (i) Inferior product quality in comparison to other competitors (standards about quality management, food safety codes, Japanese agricultural standards - JAS, labelling, and packaging regulations), and (ii) Unstable sourcing. This research did not provide a comprehensive assessment of the Japanese market, nor of the preferences, tastes, and evaluations of Japanese consumers regarding fruit and vegetable products, thus the proposed strategies are not tailored to the target market [10].

Examining the competitiveness of juice-exporting nations in the Japanese market, S.T. Feleke, et al. (2009) [11] utilised a market structure analysis method. This method incorporated a time-series regression model to discern and categorise two distinct market structures (homogeneous competition and heterogeneous competition) within the framework of consumer demand theory. The study found that Brazil stands to gain the most

when Japanese consumer income rises. Moreover, demographic shifts, particularly the recent negative population growth, influence juice demand in the Japanese market. The research indicates that price elasticity for juice demand is low, making it difficult for most exporters to expand market share through price cuts. Consequently, these exporters tend to concentrate on product promotion and differentiation. This study also predicts that juice demand growth in Japan will decelerate up to 2020, given the nation's declining population.

In the study "The export of Vietnamese fruits and vegetables to the Japanese market", secondary data was used to analyse the Japanese import market and the current status of Vietnamese fruit and vegetable exports to this market. The research primarily highlighted the export turnover of Vietnamese vegetables and fruits to the Japanese market. However, it did not assess the commercial advantage of Vietnam's vegetables and fruits, nor did it compare the commercial advantages of Vietnam's produce with those from other countries exporting to the Japanese market [12].

Other related studies on the fruit and vegetable sector conclude that Vietnam is among the nations with rapidly growing fruit and vegetable industries. Furthermore, research suggests that the added value of Vietnamese agricultural products remains limited, and offers recommendations to enhance this added value in the Vietnamese fruit and vegetable sector. Nevertheless, these studies do not delve into the specifics of Vietnam's fruit and vegetable exports, nor do they present in-depth solutions for these exports [13].

A host of other studies indicate that agricultural export activities are influenced by various factors: the population of the exporting and importing countries (represented by workers engaged in production), GDP per capita (indicative of consumption levels), and the inflation rate of the exporting country. Moreover, a country's export performance is shaped by the consumer base in the importing nation [14-19]. Consistently, multiple studies highlight that for successful agricultural exports, products must meet stringent food safety standards and limit agrochemical residues [16, 20, 21].

Additionally, there are other studies on competition, overall competitiveness, and the competitiveness of specific Vietnamese agricultural products when exported globally [22-25]. These studies also include research into the competitiveness of Vietnam's export tea industry

[26] and the coffee industry [27], among others. Several investigations have highlighted that investing in agricultural products remains a pressing concern for the Vietnamese government [28]. Despite its capability to produce a broad range of high-quality agricultural items, the majority of Vietnam's agricultural outputs are exported in their raw form, remaining unfamiliar to international consumers. Vietnam's fruit and vegetable sector lacks a consistent brand, international geographical indication certificates, GlobalGAP standards, and so forth. Consequently, Vietnamese fruits and vegetables have yet to secure a strong position in the global market, with their quality often being compared to produce from other regions, leading to a declining brand reputation [29, 30].

Few studies focus on the taste preferences of importing countries, such as Japan, when considering solutions for exporting fruits and vegetables from one region or country. Most research pertains to general fruit and vegetable exports. Thus, the topic "Fruit and vegetable consumption tastes of Japanese people and Vietnam's export potential" is a crucial area of investigation. This study aims to offer insights that could enhance the export turnover of Vietnamese vegetables and fruits to the Japanese market.

3. Methodology and data

3.1. Data collection methods

Secondary data were collected from the Statistical Yearbooks of Vietnam, the statistics of the Vietnamese Ministry of Agriculture and Rural Development in 2020, the Vietnamese General Department of Customs, and the Department of Cultivation and Plant Protection of Vietnam.

Primary data were gathered from interviews with Japanese consumers and Vietnamese enterprises exporting vegetables and fruits to the Japanese market.

Initially, this study selected a random sample of 53 Japanese consumers. For this group, primary data encompassed general information about Japanese consumers (age, gender, education, occupation, etc.); frequency of purchasing fruit and vegetable products; places of purchase; preferred fruit and vegetable products; and evaluations of the quality, price, design, variety, etc., of Vietnam's fruit and vegetable products.

Subsequently, the survey selected a sample of 73 Vietnamese enterprises exporting vegetables and fruits to the Japanese market. According to data

from the General Department of Vietnam Customs in 2019 [31] and the Department of Agricultural Product Processing and Market Development, Ministry of Agriculture and Rural Development in 2020, the total number of enterprises exporting vegetables and fruits (both fresh and processed) to Japan was 263. Thus, based on the Slovin formula with a permissible error of 10%, the random sample chosen encompassed 73 enterprises. Within each enterprise, five individuals associated with exporting vegetables and fruits to Japan were interviewed. These interviewees included a director, a deputy sales director responsible for the enterprises' fruit and vegetable export activities, and three employees involved in the export activities of the vegetables and fruits to the Japanese market. Here, the primary data centred on Vietnamese enterprises' evaluations of the demand and market potential for Japanese fruit and vegetable products.

3.2. Analysis methods

Descriptive and comparative method: Utilising descriptive statistical parameters such as absolute number, relative number, mean, etc., to analyse the volume and value of Japan's fresh fruit imports in 2019; import turnover and growth rate of the Japanese market's fruit and vegetable imports from 2014 to 2019; the value of Japan's vegetable and fruit imports from Vietnam; and the characteristics of Japanese consumers.

Scoring and analysis of the Likert scale: This method was employed to score criteria and factors influencing the export of Vietnam's vegetables to Japan. Factors considered include habits and consumption patterns of Japanese consumers; preferences of Japanese consumers regarding Vietnamese fruits and vegetables; consumption trends of Japanese individuals for Vietnamese vegetables and fruits; income levels of Japanese consumers; and requirements and standards for Japanese fruit and vegetable imports.

The significance of each mean value on the Likert scale is represented as:

$$\text{Distance value} = (\text{Maximum} - \text{Minimum}) / n = (5 - 1) / 5 = 0.8$$

The interpretations for the 5 levels on the Likert scale are as follows: "1.00-1.80: strongly disagree/very dissatisfied/very inconsequential; 1.81-2.60: disagree/dissatisfied/not important; 2.61-3.40: neutral/no opinion; 3.41-4.20: agree/satisfied/important; 4.21-5.00: strongly agree/very satisfied/very important".

4. Results and discussion

4.1. Japanese consumption market for imported fruits and vegetables

Japanese consumption market for imported fruits and vegetables: Japan is a significant consumer market for fruits and vegetables, with the Japanese populace demonstrating a consistently high demand for vegetables [32]. Notably, the budget allocated for vegetables and fruits in the total cost of living has seen an increase among the Japanese in recent years [32]. Moreover, products like juices, snacks, ice creams, and supplements made from fresh fruits and vegetables are also favourites among the Japanese. The substantial demand for fruits and vegetables in Japan can be attributed to a traditionally vegetable-based diet, heightened national health consciousness, and the availability of a diverse range of fruits and vegetables. Nonetheless, due to the ageing population, there is a decrease in the number of working-age individuals, leading indirectly to a reduction in domestic fruit and vegetable production. This, combined with the high selling prices, means that Japan has a significant reliance on imports to satisfy consumer needs [33].

Japan's primary sources of vegetable and fruit imports are China, the US, the Philippines, Mexico, and New Zealand. China stands as the dominant export market, accounting for nearly one-third of Japan's total fruit and vegetable imports in 2019. China's most significant contributions come from fresh and processed vegetables. This is closely followed by the United States, which holds about an 18% market share of the total value of Japan's fruit and vegetable imports (Fig. 1).

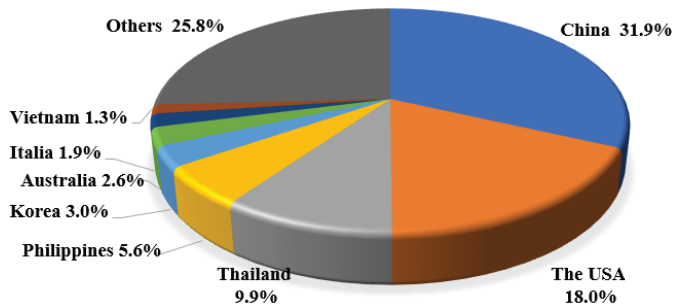


Fig. 1. The proportion of vegetables and fruits imported to Japan from other countries in 2019. Source: International Economic and Trade Organization (2020).

From 2016 to 2018, Japan spent nearly one hundred billion USD annually on importing vegetables and fruits, with the growth rate of fruit and vegetable imports in the Japanese market averaging 1.7% per year. By 2020, the total import turnover for Japan

reached \$9.38 billion; this comprised \$2.31 billion for fresh fruits and vegetables and \$3.55 billion for processed ones. The demand for fresh fruit and vegetable imports in Japan seemed to have reached a plateau during the 2016-2020 period. In contrast, there remains growth potential for the import of processed fruit and vegetable products (Table 1).

Table 1. Import turnover of vegetables and fruits of Japan [34].

HS code	Product group	Import turnover (unit: million USD)					Average (%)
		2016	2017	2018	2019	2020	
07	Edible vegetables, tubers, and stems	24,685.9	24,950.7	25,829.4	24,703.1	23,123.4	98.4
08	Edible fruit and rind	31,604.0	31,572.6	34,333.7	34,654.0	35,193.5	102.7
20	Processed vegetables, fruits, nuts, and parts of plants	31,470.3	33,164.6	35,335.9	35,328.3	35,556.0	103.1
Total		87,760.3	89,687.9	95,499.0	94,685.3	93,872.9	101.7

In the period from 2014 to 2019, the average demand of the Japanese market for fresh fruit was estimated at 5.3 million tonnes per year. In 2019, Japan imported a third of fresh fruits (about 1.7 million tonnes), with bananas having the highest import volume (accounting for 58.6%) (Fig. 2).

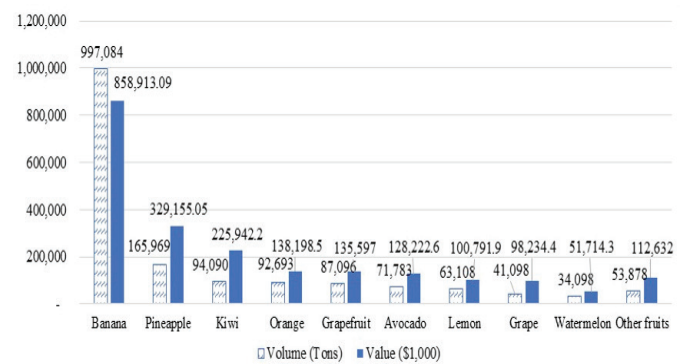


Fig. 2. Imported volume and value of fresh fruits in the Japanese market in 2019 [32].

According to the USDA (2019), overall, the Japanese demand for fresh fruit has decreased in recent years due to competition from processed goods (snacks or other desserts), especially among young Japanese consumers [32]. However, the demand for fresh fruit from the Japanese elderly has increased because it is sweet, easy to peel, and simple to prepare. This presents an export opportunity for Vietnam's tropical fruits, such as bananas,

mangoes, dragon fruit, and lychees, to the Japanese market. The demand in the Japanese market for these fresh fruits is substantial, whilst domestic production can only supply a small fraction. The yield of lychees grown in Japan meets just 5% of the domestic market, with the harvesting season being quite brief (from mid-June to mid-July). Consequently, domestic lychees are sold as a premium product, particularly those grown in the Miyazaki province. In this province, lychees can be sold directly from farmers to consumers, fetching prices of nearly \$10 per fruit. If Vietnam capitalises on seasonality and employs processing technology, they could supply fresh, frozen, or canned lychees to Japanese consumers year-round.

The Japanese demand for imported processed fruit products, such as canned, frozen, and dried, has remained consistent over the past six years. The total volume of processed fruit imported into Japan in 2019 was 415 thousand metric tonnes [35], a decrease of 0.4% compared to the previous year. Nonetheless, this import value in 2019 exceeded 1 billion USD, marking a 4.0% increase compared to 2018 (Fig. 3). Japanese farmers have always prioritised the production of fresh fruit, with the exception of certain areas dedicated to fruit juice processing. Therefore, the Japanese market will continue to depend on imports of processed fruit products to satisfy consumer demand.

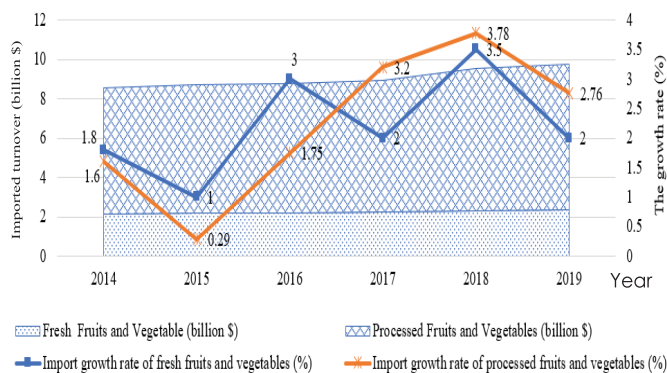


Fig. 3. Imported turnover and growth rate of fruits and vegetables in the Japanese market from 2014 to 2019 [32].

4.2. Imported Vietnamese fruits and vegetables in Japan from 2016 to 2020

According to evaluations from managers, officers, and employees of enterprises exporting vegetables and fruit to Japan, the potential demand of the Japanese market for imported fruits and vegetables is substantial compared to other markets. Concurrently, the results of this survey also indicate that the Japanese demand and market potential for fruit and vegetable products are promising, based on the Likert scale (Table 2). The meanings of the 5 levels on the Likert scale

are: "1.00-1.80: very disagree/strongly dissatisfied/very inconsequential; 1.81-2.60: disagree/dissatisfied/not important; 2.61-3.40: no opinion/average; 3.41-4.20: agree/satisfied/important; 4.21-5.00: strongly agree/strongly satisfied/very important".

Table 2. Assessment of 73 Vietnamese enterprises on the demand and market potential of Japanese fruit and vegetable products.

Items	Average grade	Assessment level (%)					General assessment
		1	2	3	4	5	
1. Habits and consumption of Japanese consumers	3.52	2.27	6.82	34.42	49.68	6.82	Good
2. Consumption tastes of Japanese consumers towards Vietnamese fruits and vegetables	3.48	2.60	7.14	37.01	46.10	7.14	Good
3. Japanese consumption trends of Vietnamese vegetables and fruits	3.43	0.97	6.17	44.16	46.10	2.60	Good
4. Income of Japanese consumers	3.53	1.62	5.84	37.99	47.08	7.47	Good
5. Requirements and standards for Japanese imported fruit and vegetables	3.48	1.95	5.84	40.91	44.81	6.49	Good

Source: Authors' survey (2020).

According to Vietnam's Ministry of Agriculture and Rural Development (2020), the total export value of vegetables and fruits in 2020 reached 3.26 billion USD. Japan's imports of fruits and vegetables from Vietnam were 89.6 million USD in 2016 and increased to 156.5 million USD in 2020 [34]. The export structure of these products remains somewhat consistent: the group of vegetables and stems accounts for about 30%, the group of edible fruits and rinds constitutes roughly 33%, and the remainder consists of processed vegetables, fruits, nuts, and parts of plants (Table 3).

Table 3. Japan's imported value of vegetables and fruits from Vietnam [36].

HS code	Product group	Unit: million USD					Average (%)
		2016	2017	2018	2019	2020	
07	Edible vegetables, tubers, and stems	29.8	30.8	34.1	40.8	31.1	101.1
08	Edible fruit and rind	23	28.9	36.3	34.0	52.7	123.0
20	Processed vegetables, fruits, nuts, and parts of plants	36.8	36.7	40.8	53.6	72.8	118.6
Total		89.6	96.4	111.2	128.4	156.5	115.0

Within the first group (edible vegetables, tubers, and stems), potatoes are predominant, followed by mushrooms, legumes, and carrots. A smaller number

of spices and vegetables are also exported, mainly coriander and perilla. Edible fruits and rinds primarily comprise cashews, dragon fruit, bananas, coconuts, and passion fruit. Processed vegetables are predominantly tropical products such as aubergine, salted papaya, cucumber, and bamboo shoots. Processed fruits include cashews, almonds, jams, apricots of all varieties, and pineapple (Table 4).

Table 4. Some of Vietnam's main export vegetables and fruits to the Japanese market [31].

Edible vegetables, tubers, and stems (HS 07)	Edible fruit and rind (HS 08)	Processed vegetables (HS 20)	Processed fruits, nuts, and parts of plants (HS 20)
Tubers (sweet potatoes, taro), wood ear and mushrooms, okra, cowpeas, peppers, carrots, cucurbits, corn/ frozen maize, eggplant, pickled vegetables, cabbage	Cashews, dragon fruit, mango, banana, coconut, passion fruit, citrus, jackfruit, pineapple, durian, and melon	Mixed processed vegetables, spinach, sweet corn, vegetable soybeans, salted vegetables (e.g., eggplant, papaya, cucumber...), products made from potatoes, bamboo shoots, beans, and mushrooms.	Cashew nuts, almonds, jams, and all kinds of apricots, aloe vera. Fruit juices, frozen pineapple, fresh coconut. Products processed from pineapple, sweet potato, vegetable food, tea

4.3. Regulations on importing fruits and vegetables into the Japanese market

Japan is a potential import market, but it is also a very stringent one. Japan's regulations on the import control of vegetables and fruits are conducted through the tariff quota system. Importers are required to apply to the Department of International Economic Affairs, within the Ministry of Agriculture, Forestry and Fisheries of Japan, to receive a quota within the preferential tariff rate. According to the Plant Protection Law, importing large quantities of fresh vegetables and fruits into Japan can only be carried out at specific airports or seaports equipped to implement plant protection measures, thereby preventing diseases and pests from entering. Consequently, the importing party must identify a suitable seaport or airport for unloading the goods before shipping from the exporting country. Documentation required for the quarantine of goods at Quarantine Stations must be presented immediately after the fruits and vegetables arrive at the port. The Ministry of Health, Labour and Social Welfare, and the Japanese Environment Agency are tasked with establishing and monitoring pesticide residue levels, adhering to the Food Sanitation Law [33]. Therefore, to export fresh and processed vegetables and fruits to Japan, foreign manufacturers need to provide pesticide residue test results and production chain diagrams.

4.4. The Japanese consumers' cultural consumption of fruit and vegetable products

The decline in Japan's population since 2013, coupled with its ageing demographic, is a significant factor impacting the reduced sales of fruits and vegetables (Table 5). Notably, older Japanese consumers typically require fewer calories. Also, many are financially limited, leading to reduced daily food expenditure. Given the country's declining and low birth rate, and with little indication that Japan's immigration policy will shift in the foreseeable future, this demographic trend will continue to influence food patterns both presently and in the mid to long term. As a result, the sales of fruits and vegetables in Japan are anticipated to continue their decline.

Table 5. Characteristics of Japanese consumers.

Item	Unit	Value
1. The number of Japanese consumers	People	53
Male	%	20.75
Female	%	79.25
2. Age		
Under 30 years old	%	15.09
From 31 to 40 years old	%	20.75
From 41 to 50 years old	%	30.19
Over 50 years old	%	33.96
3. Occupation		
Officers	%	13.21
Workers, manual workers	%	18.87
Housewives	%	32.08
Farmers	%	11.32
Others	%	24.53
4. Number of people in the household	People	2.36

Source: Authors' survey (2020).

Elderly Japanese consumers tend to uphold traditional approaches to fresh food shopping. In contrast, the younger generation is more experimental and keen on sampling a variety of foreign foods. Accordingly, the surge in convenience-focused processed food has affected fresh food consumption. The burgeoning presence of affordable fast food outlets offers consumers a wider range of reasonably priced, decent quality food options. A survey of 53 Japanese consumers revealed that the majority (approximately 60%) are over 41 years old. Of this group, about 32% are homemakers, while roughly 32% are officers, workers, or manual labourers. On average, Japanese households comprise 2.4

individuals. This demographic detail significantly impacts the frequency and demand for fruits and vegetables. Given Japan's ageing population, products with healthful ingredients will remain a primary consumer trend. Japanese consumers are inclined to spend more on foods perceived as healthy and safe. Media reports highlighting risks can have a profound and enduring effect on food consumption behaviours in Japan.

The prevailing view among Japanese people is that domestic products are superior. However, the current trend shows that imported goods tend to be cheaper, especially agricultural products (vegetables, fruits) imported from other Asian countries such as Thailand, Vietnam, Indonesia, and Malaysia. As a result, Japanese consumers are becoming increasingly interested in these imported agricultural goods. According to the survey, the frequency of vegetable and fruit consumption by Japanese individuals is rather high. Approximately 80% of respondents reported consuming fruit and vegetable products daily or 2-3 times a week (Fig. 4).

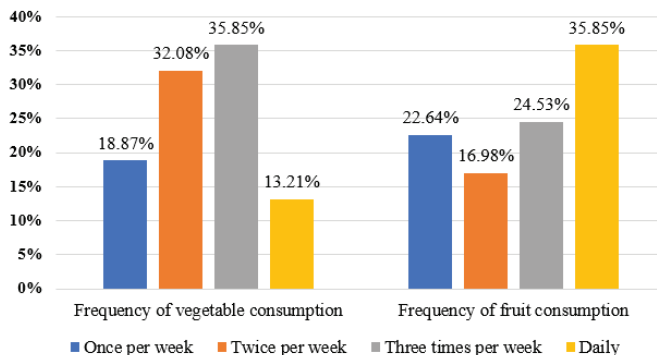


Fig. 4. Frequency of consumption of vegetables and fruits by Japanese consumers. Source: Authors' survey (2020).

The places where Japanese consumers purchase fruit and vegetable products are varied, encompassing supermarkets, department stores, specialised fruit and vegetable shops (both specialty and imported), convenience stores, and online platforms (Fig. 5). Japan's distribution and retail systems are highly developed. With a current shortage of domestic agricultural products, there has been a shift towards imported goods. The survey indicates that Japanese people have a plethora of options when buying vegetables and fruits. This presents an opportunity for Vietnam to establish and grow the supply chain of Vietnamese fruits and vegetables for export to Japan.

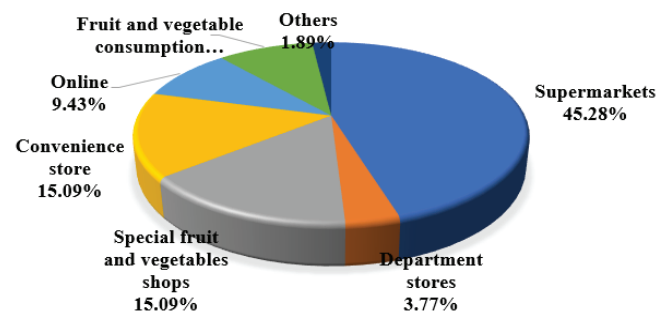


Fig. 5. Places where Japanese consumers purchase fruits and vegetables. Source: Authors' survey (2020).

The survey results show that the types of fruit and vegetable products favoured by the Japanese are diverse, ranging from fresh, frozen, canned, dried, processed, juices, to squashes, and more (Table 6). This contrasts sharply with Vietnamese consumers, who predominantly prefer fresh products. The varied preferences of Japanese consumers offer a significant opportunity for Vietnamese businesses to penetrate and export to the Japanese market. Depending on their unique strengths and advantages, Vietnamese enterprises can select specific products to produce and export to Japan.

Table 6. Preferred fruit and vegetable products of Japanese consumers.

Item	Quantity (n=53)	Percentage (%)
1. Favourite vegetable products		
Fresh vegetables	15	28.30
Frozen vegetables	5	9.43
Canned vegetables	9	16.98
Dried vegetables	2	3.77
Processed vegetables	4	7.55
Squeeze vegetables	13	24.53
Pickled vegetables	5	9.43
2. Favourite fruit products		
Fresh fruit	9	16.98
Frozen fruit	7	13.21
Canned fruit	6	11.32
Dried fruit	7	13.21
Processed fruit	9	16.98
Juice fruit	15	28.30

Source: Authors' survey (2020).

The survey results revealed that all 53 Japanese respondents had purchased Vietnamese fruit and vegetable products (Table 7). According to the participants, the quality of current Vietnamese fruit and vegetable products, while diverse and more

affordable, is perceived to be lower than that of some other countries. This presents both a challenge and an opportunity for Vietnamese products looking to expand into the Japanese market. To progressively gain a stronger foothold in Japan, Vietnamese agricultural products need to elevate their quality and diversify their offerings. Specifically, Vietnamese businesses should concentrate on Vietnam's agricultural strengths and leverage their competitive pricing to vie with products from other nations.

Table 7. Japanese consumers' evaluation of imported fruits and vegetables.

Japanese consumers' evaluation	Quantity (n=53)	Percentage (%)
1. Number of interviewees who have ever bought vegetables from Vietnam	53	100
2. Fruits and vegetables from which country are considered the most favourite?		
The USA	18	33.96
China	14	26.42
Thailand	8	15.09
Vietnam	8	15.09
Others	5	9.43
3. Is it easy to find and buy fruit and vegetable products from Vietnam?	19	35.85
4. Assess the diversity of Vietnamese fruit and vegetable products compared to other countries		
More diverse	12	22.64
Similar	19	35.85
Less diverse	22	41.51
5. Assess the price of Vietnamese fruit and vegetable products compared to other countries		
More expensive	8	15.09
Similar	19	35.85
Cheaper	26	49.06
6. Assess the quality of Vietnamese fruit and vegetable products compared to other countries		
More delicious	9	16.98
Similar	17	32.08
Less delicious	27	50.94

Source: Authors' survey (2020).

According to the survey, Japanese consumers are willing to pay more for healthy and safe food, and the frequency of vegetable and fruit consumption by the Japanese is quite high. The Japanese have a plethora of places to buy vegetables and fruits. The quality of current Vietnamese fruit and vegetable

products is perceived by the Japanese as being lower than some other countries, but they are diverse and more affordable in comparison.

4.5. Policy implications

Vietnam's fruit and vegetable export turnover to Japan has been growing, but the import value of Vietnamese vegetables and fruits to Japan remains modest compared to the overall import value of vegetables and fruits in Japan. The export of Vietnamese fruits and vegetables to Japan encounters several challenges, notably stringent product quality requirements. To boost the export of Vietnamese vegetables and fruits to the Japanese market, this study recommends several policy implications:

4.5.1. Establish an import market assessment centre in each Vietnamese exporting enterprise

Understanding the intricacies of the import market is pivotal for successful export businesses. Fruits and vegetables, given their seasonal nature and food safety concerns, coupled with Japan's rigorous product quality standards, make market comprehension essential. Vietnamese export enterprises should research not only macro aspects like demand, quality, and import regulations but also understand Japanese consumer preferences. Establishing an import market assessment centre staffed with individuals proficient in market assessment is crucial.

4.5.2. Undertake in-depth market studies of fruit and vegetables in Japan

Comprehensive market analysis is indispensable for Vietnamese enterprises. The areas of study include types and volumes of fruits and vegetables, quality specifications, acceptable import prices, and optimal export timings.

4.5.3. Enhance understanding of Japanese consumer culture

The Japanese value long-standing relationships built on trust, loyalty, and verbal commitment. Vietnamese enterprises should position themselves as dependable, long-term partners. Demonstrating sincerity and honesty during negotiations is paramount. Furthermore, the Japanese often value verbal agreements over written contracts, so businesses should strictly adhere to any commitments regarding production, processing, and preservation. It would also be beneficial to promote understanding of Japanese consumer culture through initiatives such as hosting Japanese

Culture Week in Vietnam and Vietnamese sales festivals in Japan.

4.5.4. *Ensure the quality of exported fruits and vegetables*

Japan is a discerning market with stringent hygiene and safety standards, especially for vegetables and fruits. Direct quality checks are more important to them than third-party certifications. To successfully export to the Japanese market, Vietnamese products should adhere to standards such as GlobalGAP, JGAP, advanced quality management systems like HACCP, ISO, SSOP, and the Safety and Hygiene Rules in Japan. Continuous and strict application of these standards is essential.

4.5.5. *Amplify trade promotion activities*

Effective market research is vital. Information regarding supply, demand, pricing, quality, consumption trends, and competitors should be diligently gathered, analysed, and forecasted. This data can be procured through embassies, business support associations, fairs, exhibitions, and media outlets. Vietnamese enterprises should be proactive in joining trade promotion programmes to bolster Vietnam's fruit and vegetable industry. Participation in renowned Japanese food fairs, such as Foodex Japan Chiba, Foodex Japan Tokyo, and Wine and Gourmet Japan Tokyo, is recommended. Moreover, leveraging digital technology for trade promotion-like website creation and use of email, Skype, and Facebook for information exchange - is essential.

5. Conclusions

Japan offers a promising market for Vietnam's fruit and vegetable exports. Yet, Vietnam's market share in this import arena remains below 2%. The burgeoning import demand, shifting consumption habits, and the Japanese consumer's desire for product diversification present an opportunity for Vietnam's tropical fruits and vegetables. Survey results indicate that the Japanese have a high frequency of fruit and vegetable consumption: 80% of participants consume these daily or 2-3 times a week. The outlets where Japanese consumers purchase these products are varied, including supermarkets, department stores, specialised fruit and vegetable shops (both niche and imported), convenience stores, and online platforms. Their preferences encompass a broad range of product types, from fresh to frozen, canned, dried, processed, and even juices.

Moreover, from the Japanese consumers' standpoint, while Vietnamese fruit and vegetable

products might not meet the quality of those from some other nations, they do offer variety and come at a more affordable price. Vietnamese exports encompass a broad range, including edible vegetables, tubers, stems, fruits, rinds, as well as processed variants of these. To bolster the export of Vietnamese vegetables and fruits to the Japanese market, this study proposes several policy implications: (i) Establish an import market assessment centre in every Vietnamese exporting enterprise; (ii) Enhance market forecasting capabilities; (iii) Deepen understanding of Japanese consumer culture; (iv) Ensure top-notch quality for exported fruits and vegetables; and (v) Amplify trade promotion efforts.

CRediT author statement

Nguyen Thi Thuy: Conceptualisation, Data curation, Writing - Original draft preparation; Tran Dinh Thao: Methodology; Tran Thi Thuong: Visualisation, Writing - Reviewing; Dinh Cao Khue: Supervision, Investigation; Dinh Gia Nghia: Software, Validation, Editing.

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COMPETING INTERESTS

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

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Green economic model adapting to climate change and disaster prevention in Bach Long Vi island district, Hai Phong city

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Abstract:

In recent years, the economic model in Bach Long Vi island district has been maintained on a small scale, spontaneously, and heavily influenced by natural factors. Additionally, the impacts of climate change and the degradation of natural resources and the environment are increasing burdens on local socio-economic development. Therefore, this study aims to examine and build a compatible green economic model to help adapt to climate change and prevent natural disasters in the island district. The authors have researched and built a green economic model with three main activities (fishery logistics, tourism, and aquaculture), helping economic growth, improving people's quality of life, and minimising the negative impact on the ecological system. The effectiveness of the green economic model is evaluated through a set of criteria with many contents, such as economic efficiency, the ability to create jobs and improve people's living standards, and the level of renewable energy use, ecological and environmental conservation. In the end, groups of general and specific solutions are proposed to help strengthen the development and implementation of green economic models in the island district, ensuring adaptation to climate change, disaster prevention, and assurance of efficiency and sustainability for the environment, economy, and society.

Keywords: Bach Long Vi island district, climate change, green economy, models, natural disasters.

Classification numbers: 2.1, 5.2

1. Introduction

Bach Long Vi island is an island district in Hai Phong city, located at geographic coordinates 20°07'35'' to 20°08'36'' North latitude and 107°42'20''-107°44'5'' East longitude. Despite its modest size, covering just over 3 km², Bach Long Vi plays a significant role within the system of 2,376 coastal islands, serving as a fully-fledged administrative unit at the district level in the coastal island districts of Vietnam [1, 2]. Situated in the heart of the Gulf of Tonkin, Bach Long Vi island district is imbued with great potential for diverse economic sectors, including fisheries logistics, tourism, aquaculture, energy, oil and gas, and more [2, 3].

In recent years, Bach Long Vi's economic model has shown promising signs of growth. Nevertheless, it faces several challenges that hinder its full potential and advantages. Generally, the island

district's economic model is characterised by small-scale operations, spontaneity, susceptibility to various factors (such as weather conditions, environmental factors, and a small population), and lacks sustainable integration [4]. Moreover, due to its remote location from the mainland, the island's residents often encounter difficulties in securing suitable livelihoods and accessing quality healthcare, education, and social benefits [1]. Additionally, the island community grapples with serious issues such as resource depletion, environmental pollution, and increasing vulnerability to natural disasters. Consequently, many district residents experience a relatively low quality of life, regularly facing risks from natural disasters and health issues. These challenges contribute to the outmigration of people from the island to the mainland and deter individuals from relocating to Bach Long Vi island for residence and

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economic development. In light of these issues, there is a pressing need to establish a compatible economic model aimed at creating stable, long-term livelihoods, enhancing the material and spiritual well-being of the island's inhabitants, attracting individuals to migrate to and thrive on the island, and ultimately achieving the overall sustainability of the island district. This will enable Bach Long Vi to assume its strategic role on the map of Vietnam's sea and islands, serving as the country's maritime "gateway" for international and regional exchanges, especially in terms of national security and marine economy development.

Hence, this research will align with the development goals of Hai Phong city and the economic status of Bach Long Vi to develop a suitable green economic model for the region. This model will facilitate adaptation to climate change and effective responses to natural disasters, forming an essential foundation to ensure the balanced development of the three key factors-economy, society, and the environment-towards sustainable development in the foreseeable future.

2. Methodology

2.1. Methods for data collection and documentation

Data collection and synthesis methods will involve reviewing previous documents, research works (primarily focusing on the outcomes of socio-economic initiatives in Bach Long Vi island district from 2020 to 2022), and other ecological and environmental data [2-7].

Seminars, interviews, and expert consultations will be employed to analyse and evaluate data, establish information systems, and consolidate data.

2.2. Methods for environmental and biological resource assessment

This category encompasses techniques for assessing the current environment, natural assets, and challenges impacting the development of a green economic model in Bach Long Vi.

Investigation, survey, and laboratory analysis of samples (air quality, water quality, and organisms) in accordance with Vietnamese standards and regulations or widely recognised methods [8, 9].

Utilisation of GIS (Geographic information system) methods to create a comprehensive map of the fisheries, aquaculture, and tourism logistics

service centre, scaled at 1:10,000, to support the development of the green economic model in Bach Long Vi district.

2.3. SWOT analysis

SWOT analysis stands as the central method for researching and devising an appropriate green economic model for Bach Long Vi island district. SWOT is an acronym derived from the initial letters of English terms: Strengths, Weaknesses, Opportunities, and Threats. This analysis will provide an improved understanding of the context in Bach Long Vi island district, enabling the formulation of development objectives and strategies based on the equilibrium between strengths, weaknesses, opportunities, and challenges.

2.4. Methods for establishing a set of criteria to evaluate green economic models

The expert approach is employed to create a set of criteria for evaluating green economic models concerning three economic components: fishery logistics, experiential tourism, and high-tech aquaculture.

Personnel involved in the development of the set of criteria: Experts from government agencies, research organisations, and other relevant stakeholders participated in the development of criteria for assessing the green economic model of Bach Long Vi island district, along with determining the weights for each component criterion. These experts possess extensive experience in various fields, including green economy, environmental technology, human geography, biology, and tourism, among others.

Weight determination criteria: In this study, the authors applied the following method to evaluate the development level of the green economic model for a specific area based on the general index presented in previous studies [10, 11]:

$$GEI = \sum_{i=1}^n K_{Bi} K_i$$

where GEI stands for the general index of green economic development, K_{Bi} denotes the weight of the criterion i , and K_i denotes the score achieved by criterion i , n : constant.

K_{Bi} is divided into three levels, denoted 1, 2, 3, corresponding to increasing importance (low,

moderate, and high). For K_i , the study proposes rating points as 0, 2.5, 5, 7.5, and 10, aligning with 5 rating levels (Unsatisfactory, L1, L2, L3, and Exceeded L3). Based on the results of the assessment of criterion weights (K_{Bi}) and criterion scores (K_i) evaluated by experts with extensive experience in the field of green economy and a deep understanding of Bach Long Vi, the overall green economic development index (GEI) is categorised into different levels to evaluate the development stage of the green economic model, including (i) Unsatisfactory (M1: $0 \leq GEI \leq 70$); (ii) Oriented towards green economic

development (M2: $71 \leq GEI \leq 135$); (iii) In progress (M3: $136 \leq GEI \leq 200$); (iv) Green and sustainable (M4: $GEI > 200$) [10, 11].

3. Results

3.1. SWOT analysis of strengths, weaknesses, opportunities and challenges in building a green economic model in Bach Long Vi island district

Utilising SWOT analysis, an assessment of the strengths, weaknesses, opportunities, and threats in establishing a green economic model in Bach Long Vi island district has been conducted, as shown in Table 1 [1, 2, 12-14].

Table 1. Summary of strengths, weaknesses, opportunities, and threats to building a green economic model in Bach Long Vi island district.

Ordinal number	Component	Characteristic
1	Strengths	- Bach Long Vi occupies a crucial strategic position in national defence and security, making it conducive to the development of various economic sectors. - It is one of Vietnam's eight largest fishing grounds. - Abundant natural resources and stunning natural scenery are present. - The coral reef ecosystem exhibits a rich biodiversity. - There is substantial potential for renewable energy sources, including solar energy, wind, waves, and tides. - The local population is known for their friendliness and amicability. - Both Hai Phong city and Bach Long Vi district are inclined towards the development of green and sustainable economic models, offering specific preferential and supportive policies for businesses aiming to establish green economic models.
2	Weaknesses	- Infrastructure faces numerous limitations, including transportation systems, water supply, electricity, and telecommunications. - There are limited transportation options between the mainland and the island, resulting in relatively lengthy travel times (averaging 6-8 hours) that are heavily dependent on weather conditions. - Logistics services supporting fisheries, tourism, aquaculture, and other sectors remain underdeveloped. - Various environmental challenges persist, including oil pollution in ports and solid waste pollution in residential areas and ports. - The shortage of qualified and experienced human resources in green economy, sustainable tourism, high-tech aquaculture, and related fields is notable. - Insufficient availability of young, healthy, and enthusiastic human resources to participate in the development of green economic models is a concern. - The economic development in the region remains modest and straightforward, primarily centred around fishing and initial forays into tourism.
3	Opportunities	- In the future, several large-scale economic development projects will be implemented in Bach Long Vi, offering significant opportunities to transform the island district. - Vietnam consistently promotes international cooperation in green economic development within the tourism and aquaculture sectors. - Numerous opportunities exist to access support programmes from both the Government and non-governmental organisations for the development of green economic models. - Nature tourism is among the top tourism priorities for Vietnamese tourists in the post-COVID-19 period.
4	Threats	- Bach Long Vi's geographical remoteness from the mainland makes it susceptible to isolation during natural disasters. - The effects of climate change are becoming increasingly apparent, potentially impacting Bach Long Vi's economy, society, and environment. - Environmental pollution, particularly solid waste pollution, originates from external sources, primarily international ships. - Competition with neighbouring tourist destinations (Do Son, Cat Ba, Co To, etc.) is on the rise. - There is a significant reliance on external resources, including essential goods (such as food and beverages) and raw materials for construction and production. - Foreign tourists are currently not accepted.

Based on the internal and external components matrix within the SWOT model as presented in Table 1, we will propose an appropriate green economic model for the Bach Long Vi island district. This model will leverage its strengths, address weaknesses, capitalise on opportunities, and mitigate threats, all with the ultimate aim of promoting sustainable development. Specifically, by identifying and comprehending the local strengths and weaknesses, the proposed green economic model will fully exploit its advantages while effectively overcoming its disadvantages. Additionally, identifying both current and future opportunities and challenges for the locality will enable proactive solutions to be found in order to realise those opportunities and minimise threats to the socio-economic development and environment of the island district.

3.2. Orientation for building a green economic model in Bach Long Vi island district

Drawing from the synthesis of previous research conducted in Vietnam and globally, the orientation for building a green economic model in the Bach Long Vi island district will adhere to the following principles: "A green economic model with a suitable scale for the island district administrative unit with an appropriate economic structure to improve living standards, improve social equity, increase people's connection to the island, and significantly reduce environmental risks and ecological degradation". Consequently, the development of green economic models in Bach Long Vi should target the following key directions:

1. The island district's economy aims to improve the living standards of the local people (selecting an appropriate and sustainable economic structure).

2. Reducing environmental risks (applying environmental techniques in livelihood models, reducing carbon emissions, using renewable energy sources).

3. Conservation of ecosystems on the island and marine ecosystems.

4. Ensuring security, affirming, and maintaining national sovereignty over the country's seas and islands (local people do not migrate to the mainland, attracting labour forces from the mainland to the island to work, enhancing island-land connectivity).

3.3. Proposal for a green economic model in Bach Long Vi island district

Based on the legal foundations, practical needs of Bach Long Vi, and the

authors' experience in researching and implementing green economic models on islands in three regions of Vietnam [12], the orientation towards green economic development in Bach Long Vi is a promising choice. According to this approach, Bach Long Vi's economic model will encompass three main economic activities (namely, fishery logistics, experiential tourism, and high-tech aquaculture) closely interconnected, serving as the core components to establish a green economic model in Vietnam. The constructed green economic model must maintain a balance between economic, social, and environmental factors while being rooted in the input sources of the model.

The model consists of the following elements: (i) Assessment and identification of inputs to build a green economic model for Bach Long Vi; (ii) Development of an integrated green economic model suitable for Bach Long Vi; and (iii) The output of the economic model must meet specific criteria (Fig. 1). The assessment of inputs for constructing a green economic model encompasses various components, including geographical location, natural conditions, the policy framework guiding green economic model development, infrastructure and energy sources, island-land connectivity, social status, natural capital, environmental status, and economic status.

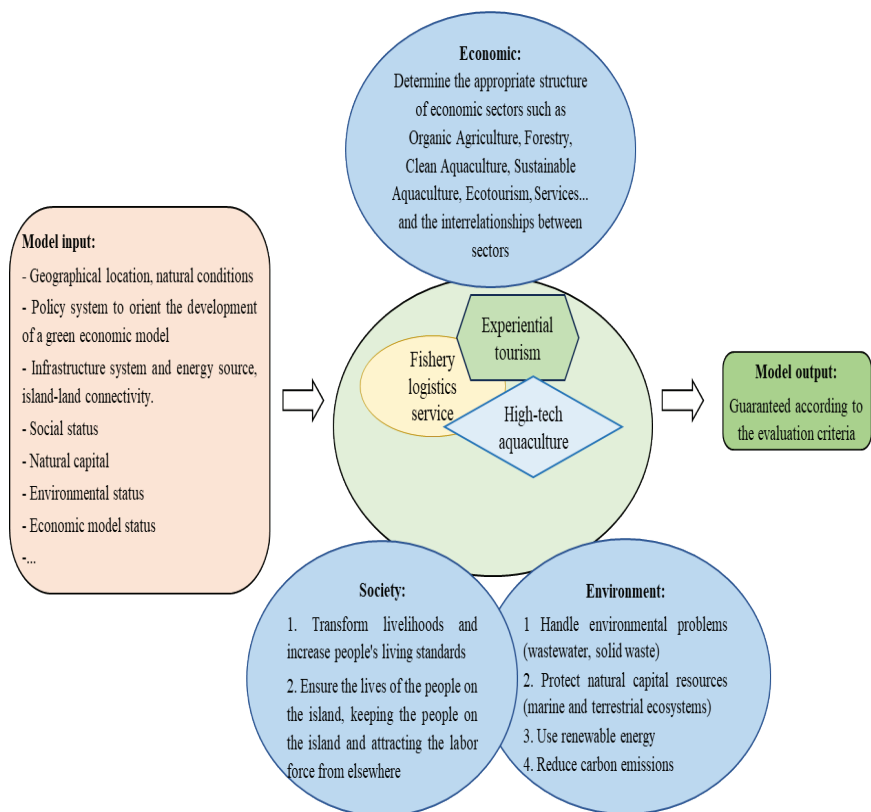


Fig. 1. Diagram of the proposed green economic model for Bach Long Vi island district.

Development of an Integrated Green Economic Model: Based on the assessment of input factors and the development orientation of Hai Phong city, where the success of green economic models applied to the sea and islands has been previously demonstrated, the core of the model should focus on building and developing three green economy-oriented economic activities in descending order of priority as follows: (1) Establishment of a fisheries logistics centre: Assessing the required supply scale for the number of ships as per regulations, while providing effective environmental protection solutions. (2) Promotion of experiential tourism: Tourism oriented towards experiential and ecological tours, encompassing exploration of the island's topography, such as rocky tidal flats, coral viewing through glass-bottom boats, fishing tours, and photography, in addition to traditional tourism activities. Tourism development should be closely linked to environmental protection and the conservation of Bach Long Vi's ecological values. (3) Development of a high-tech aquaculture centre: Evaluating natural and human conditions and material resources to guide the application of appropriate scientific and technological advancements in aquaculture for practical production. High-tech aquaculture will significantly reduce pollutant emissions into the environment, mitigating the negative impacts of extreme weather conditions in Bach Long Vi.

Output of the model: The model's effectiveness will undergo a thorough review and evaluation based on specific economic, social, and environmental criteria.

3.3.1. Establishment of a fisheries logistics service centre

The aim of fisheries logistics is to foster the development of seafood harvesting in the waters surrounding Bach Long Vi and its vicinity. This involves ensuring safety and enhancing production efficiency throughout the entire process, from the capture of seafood to the purchase and processing of fishermen's products. Fisheries logistics activities are geared towards sustainable economic development, minimising adverse impacts on the ecological environment, and reinforcing environmental protection in Bach Long Vi to enhance the well-being of its residents. The primary directions for developing fisheries logistics activities

in Bach Long Vi within a "green" framework need to address three main aspects: vessels, onboard crew, and harvested seafood.

More specifically, for vessels, the focus should be on improving their capacity to serve fishing vessels, encompassing areas for anchoring and providing services such as refuelling, oiling, repairs, and replacements. Regarding onboard crew members, solutions should be devised for essential needs such as dining, accommodation, bathing, sanitation, health, and entertainment. For harvested seafood, it is imperative to formulate a process plan that encompasses three dimensions: (i) The application of RAS (Recirculation aquaculture system) technology for recirculating culture; (ii) Investment in ice production technology to ensure a stable ice supply for freezing seafood; (iii) Investment in a drying system capable of handling large quantities of seafood, complemented by vacuum technology to create branded dried products.

Utilising GIS technology, the development space for fisheries logistics activities in Bach Long Vi is designed with a focus on green economic principles (Fig. 2). This plan comprises three key components: (1) The fisheries logistics service area; (2) Port facilities; and (3) Ship anchorage areas. Proposed scale and development type: 2023-2030: Provision of services and storm shelters for 500-600 ships, with the capacity of anchored ships at 500 HP (horsepower); 2030-2050: Provision of services and storm shelters for 600-800 ships, with the capacity of anchored ships at 1.000 HP.

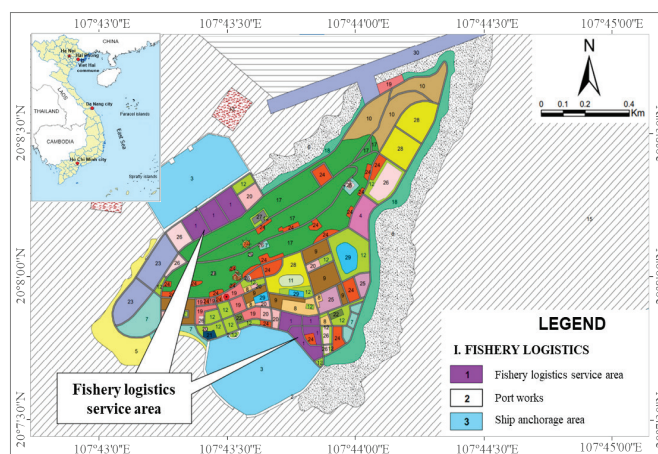


Fig. 2. Spatial zoning model for the development of fisheries logistics activities in Bach Long Vi island district [4].

In comparison to the set of evaluation criteria, as of May 2023, fisheries logistics activities in Bach Long Vi island district have scored 110 points, currently categorised as “M2: Being oriented towards green economic development” (Table 2).

Table 2. Results of assessment of fisheries logistics activities of Bach Long Vi island district according to the set of green criteria (as of May 2023).

No	Criteria	Evaluation method ($K_{Bi} \times K_i$) K_{Bi} : weight of criterion i K_i : score of criterion i achieved	Scores
1	Criterion 01: criteria for the island's road system, locks, and ports	3x5.0	15.0
2	Criterion 02: criteria for the electrical system	3x5.0	15.0
3	Criterion 03: criteria for clean water treatment stations and water storage	3x7.5	22.5
4	Criterion 04: criteria for the connection between the island and mainland	2x5.0	10.0
5	Criterion 05: criteria for seafood resources	3x5.0	15.0
6	Criterion 06: criteria for waste control from high-tech activities (mainly solid waste) and the use of environmentally friendly materials.	2x2.5	5.0
7	Criterion 07: criteria for promoting offshore fishing and prohibiting destructive fishing	2x7.5	15.0
8	Criterion 08: income criteria for individuals involved in fisheries logistics	2x2.5	5.0
9	Criterion 09: criteria for government propaganda activities involving all participants in the model	2x0	0.0
10	Criterion 10: criteria for green elements in advanced technology models and TCKN	3x2.5	7.5
Total GEI score			110.0

Source: Calculation results performed by the research team.

3.3.2. Developing experiential tourism

The orientation for developing experiential tourism activities in Bach Long Vi, within the context of a green economy, includes the following key aspects:

Adherence to city and island district policies: This involves aligning with the tourism development plans of Hai Phong city and tailoring tourism establishments and services to focus on key tourism products such as sports tourism, marine ecology, cultural and sports events related to the sea and islands.

Local community involvement: Encouraging local households to participate in experiential tourism activities, with a focus on making tourism a primary industry in Bach Long Vi. These activities should include offerings such as homestays, restaurants, transportation services, bicycle rentals, food delivery, and souvenirs.

Sustainability measures: Implementing technical measures to reduce carbon emissions and increase the use of renewable energy sources in experiential tourism activities.

Environmental management: Implementing environmental management and technical solutions to reduce waste discharge into the environment, with the aim of transitioning to a model that prohibits single-use plastic utensils on Bach Long Vi.

Ecosystem protection: Utilising solutions to protect the island's ecosystems through sustainable exploitation, emphasising indirect values over the exhaustion of direct ones.

Island migration: Ensuring that the migration rate from the island district to the mainland gradually approaches “0” by attracting mainland labour to the island for business, production, and long-term residence.

Using GIS technology, the development space for experiential tourism in Bach Long Vi is designed with a green economy focus (Fig. 3). The sightseeing experience route is designed to enable visitors to fully explore the island district, with key stops including beaches, rocky tidal flats, coral reef areas, and the

lighthouse. Notably, the areas for visiting coral reefs (near the North-West port) via glass-bottomed boats have become a significant tourist attraction in Bach Long Vi, contributing to the conservation of natural ecosystems. In addition, homestay development areas (with mobile prefab houses) and tourism service facilities are strategically distributed based on the island district's development orientation, thereby enhancing the ability to provide essential services to visitors during their stay. This is a highlight of the experiential tourism model, which also enhances climate change adaptation and disaster prevention.

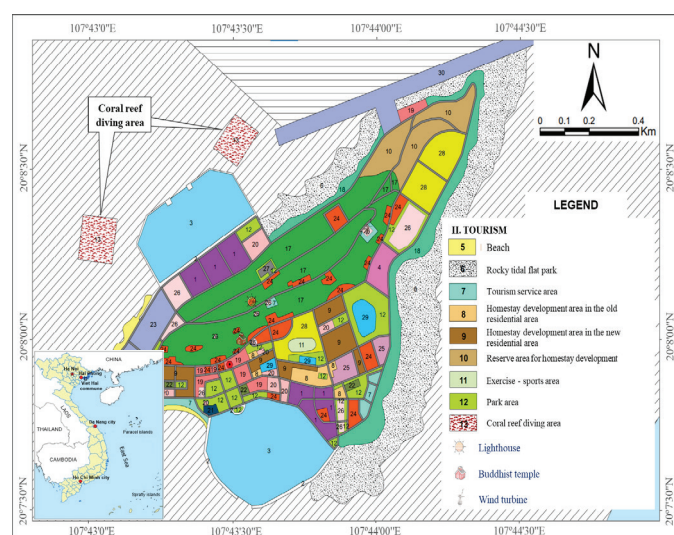


Fig. 3. Spatial zoning model for the development of experiential tourism in Bach Long Vi island district [4].

Compared with the set of evaluation criteria, as of May 2023, experiential tourism activities in Bach Long Vi island district have scored 110 points, currently categorised as “M2: Being oriented towards green economic development” (Table 3).

3.3.3. Developing high-tech aquaculture

Concerning high-tech aquaculture, two potential types are proposed for Bach Long Vi island district, meeting high technology criteria and climate change adaptation. These types include offshore seabass farming and onshore aquaculture using RAS technology. These activities are expected to promote economic development in Bach Long Vi due to the decline in fishing activities in recent years owing to the decrease in resources. Using GIS technology, the space for developing high-tech aquaculture

Table 3. Evaluation results of experiential tourism activities in Bach Long Vi island district according to the set of green criteria (as of May 2023).

No	Criteria	Evaluation method ($K_{Bi} \times K_i$) K_{Bi} : weight of criterion i K_i : score of criterion i achieved	Scores
1	Criterion 01: criteria for the island's road system, locks, and ports	3×5.0	15.0
2	Criterion 02: criteria for the electrical system	3×7.5	22.5
3	Criterion 03: criteria for clean water treatment stations and water storage	2×5.0	10.0
4	Criterion 04: criteria for the connection between the island and mainland	3×7.5	22.5
5	Criterion 05: criteria for seafood resources	2×5.0	10.0
6	Criterion 06: criteria for waste control from high-tech activities (mainly solid waste) and the use of environmentally friendly materials.	2×2.5	5.0
7	Criterion 07: criteria for promoting offshore fishing and prohibiting destructive fishing	2×2.5	5.0
8	Criterion 08: income criteria for individuals involved in fisheries logistics	2×5.0	10.0
9	Criterion 09: criteria for government propaganda activities involving all participants in the model	2×2.5	5.0
10	Criterion 10: criteria for green elements in advanced technology models and TCKN	2×2.5	5.0
Total GEI score			110.0

Source: Calculation results performed by the research team.

activities in Bach Long Vi is designed with a focus on a green economy (Fig. 4). The aquaculture area, covering approximately 3.02 hectares, is the central area for developing high-tech aquaculture activities in the locality. Additionally, there are ecological restoration areas designated as marine protected areas and zones for the development of marine protected areas.

Firstly, the aquaculture area of approximately 3.02 hectares will be utilised for the abalone hatchery and industrial farming. This area will concentrate on scientific and technological advancements to produce high-quality aquatic seed, particularly abalone, ensuring a stable supply of high-quality aquatic seed for sustainable operation. Currently, a project is underway to establish a wildlife rescue station and produce seafood to support the restoration of aquatic resources in the Bach Long Vi marine protected area, further promoting high-tech aquaculture activities in the future. Next is the abalone ecological farming area, a substantial marine space extending from the sea with a depth of 5 meters in the northeast to the sea with a depth of 5 meters in the southwest. This area will provide a favourable ecological environment for the development of aquaculture species, with priority given to abalone, followed by seaweed, sea snails, sea cucumbers, and more. Meanwhile, the marine protected area development zone is a space that can be considered, researched, and implemented in the future for barramundi (sea bass) farming.

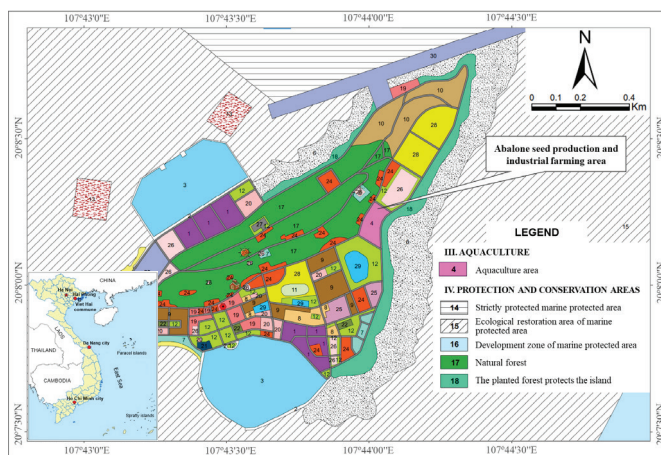


Fig. 4. Spatial zoning model for the development of hi-tech aquaculture in Bach Long Vi island district [4].

In comparison with the set of evaluation criteria, high-tech aquaculture service activities in Bach

Long Vi island district (as of May 2023) scored 75 points, categorised as “M2: Being oriented towards green economic development” (Table 4).

Table 4. Results of evaluation of high-tech aquaculture activities of Bach Long Vi island district, according to the set of green criteria (as of May 2023).

No	Criteria	Evaluation method ($K_{Bi} \times K_i$) K_{Bi} : weight of criterion i K_i : score of criterion i achieved	Scores
1	Criterion 01: criteria for the island's road system, locks, and ports	2x5.0	10.0
2	Criterion 02: criteria for the electrical system	3x5.0	15.0
3	Criterion 03: criteria for clean water treatment stations and water storage	3x2.5	7.5
4	Criterion 04: criteria for the connection between the island and mainland	2x2.5	5.0
5	Criterion 05: criteria for seafood resources	2x5.0	10.0
6	Criterion 06: criteria for waste control from high-tech activities (mainly solid waste) and the use of environmentally friendly materials.	3x2.5	7.5
7	Criterion 07: criteria for promoting offshore fishing and prohibiting destructive fishing	2x2.5	5.0
8	Criterion 08: income criteria for individuals involved in fisheries logistics	2x2.5	5.0
9	Criterion 09: criteria for government propaganda activities involving all participants in the model	2x2.5	5.0
10	Criterion 10: criteria for green elements in advanced technology models and TCKN	2x2.5	5.0
Total GEI score			75.0

Source: Calculation results performed by the research team.

3.4. Proposed solutions to build a green economic model in Bach Long Vi island district to adapt to climate change and disaster prevention

3.4.1. Integrated solutions to build a green economic model

Mechanisms and policies: Implement mechanisms and policies that promote green economic development in Bach Long Vi, with a focus on those associated with national defence and security, telecommunications, banking, and health services. Additionally, invest in passenger and cargo transportation infrastructure.

Management solutions: Enhance the role of government organisations in green economic development, implement community-based or co-management models, and adopt ecosystem-based management approaches.

Environmental solutions: Increase the use of renewable energy sources, promote environmental education and awareness, and implement environmental engineering solutions. Address wastewater and solid waste management issues in Bach Long Vi.

Human resource solutions: Attract and improve the quality of human resources to support the three main economic activities (fishery logistics, tourism, and aquaculture).

Capital mobilisation solutions: Mobilise financial investment from both the government and businesses to ensure sufficient resources for building a green economic model in Bach Long Vi.

3.4.2. Specific solutions to develop fisheries logistics activities

Several specific solutions are proposed to achieve green economic goals in the field of fisheries logistics, including: (i) Improving productivity and product quality, especially for rare and high-value seafood species in Bach Long Vi; (ii) Incorporate renewable energy sources into fisheries production and logistics; (iii) Implement intelligent and automated technology in seafood production, transportation, and preservation; (iv) Provide training, coaching, and professional development for workers in the

fisheries logistics industry; (v) Strengthen coordination among government organisations, security forces, businesses, and residential communities to promote comprehensive development of the fisheries logistics sector.

3.4.3. Specific solutions to develop tourism activities

Several particular solutions to develop green economy-oriented experiential tourism include:

(i) Integrating experiential tourism with traditional Tourism: It is crucial to conduct a comprehensive study and propose suitable preferential mechanisms and policies to the Government and city authorities. This approach aims to attract investment and enhance the quality of local tourism services. Developing tourist routes that showcase Bach Long Vi's unique tourism products linked to the homeland's sea and islands, while also emphasising territorial sovereignty and marine ecology experiences, should be a priority.

(ii) Enhancing tourism services: Experiential tourism activities like squid fishing, fishing, and coral diving should receive investment in essential equipment to ensure safety and create distinctive features for Bach Long Vi tourism. Moreover, there is a need to invest in and construct vehicles for transporting tourists between the island and the mainland, prioritising safety during operation. Utilising existing ships, such as the Hoa Phuong Do ship and Bach Long ship, to meet tourist demands is advisable.

(iii) Strengthening brand management: To boost tourism development, it is vital to focus on managing and promoting Bach Long Vi's brand values. This includes geological values, such as rocky tidal flats, and cultural values. Proper management of these unique features can significantly enhance the attractiveness of the destination for tourists.

3.4.4. Specific solutions for developing aquaculture activities

Brand value management: Prioritise the management of brand values for Bach Long Vi, especially highlighting the typical seafood species for the region, such as abalone, squid, and sea cucumber.

Abalone raising process: Develop a process for raising abalone using recirculating aquaculture system technology, combining natural culture at the adult stage with abalone.

Sea bass farming: Establish a process for raising sea bass to create new livelihoods for the island's residents, replacing traditional fishing activities. Improve management efficiency by implementing conservation measures and banning destructive fishing, while promoting high-tech aquaculture practices to increase the production of specialist species in Bach Long Vi.

4. Conclusions

Based on theoretical research, analysis, and practical assessment, it is evident that green economic development is a suitable direction for the economic growth of Bach Long Vi island district in the near future. The orientation for building a green economic model for the island district relies on natural capital (both on the island and within marine ecosystems), local and external resources (human and material), and development strategies aligned with conservation efforts. This approach aims to enhance climate change adaptation and disaster prevention.

The proposed green economic model for Bach Long Vi island district aligns with Hai Phong city's development goals and focuses on three primary activities: fisheries logistics, experiential tourism, and high-tech aquaculture.

(i) For fisheries logistics: The goal is to provide comprehensive fisheries logistics services while implementing optimal solutions for environmental protection, hygiene, and crew health. Infrastructure for anchoring ships, fuel supply, and a 12.43-hectare distribution area for crew facilities, including dining, cleaning, rest, and medical services, are essential components. Addressing waste disposal into the two docks, ensuring a pleasant landscape environment, and enhancing labour safety are immediate challenges.

(ii) For experiential tourism activities: Identified tourism products and associated challenges, particularly solid waste management, have been recognised. To meet future visitor needs, there is

a focus on increasing the quantity and quality of accommodation options (including mobile prefab models and upgrades to existing rooms). Experiential tourism products primarily utilise natural capital sources like rocky tidal flats and coral reefs, closely tied to ecological conservation activities.

(iii) For high-tech aquaculture: Two feasible types meeting high-tech criteria have been identified, namely, seabass farming and onshore farming using RAS technology. These activities aim to drive economic development in the island district as traditional fishing activities have been declining due to resource depletion.

Integrated solutions have been proposed to build a green economic model that aids climate change adaptation and natural disaster prevention in Bach Long Vi island district, encompassing policies, management, environmental considerations, human resources, and capital mobilisation. Specific solutions for individual economic activities (fishery logistics, experiential tourism, and high-tech aquaculture) have been presented, offering creative and viable strategies to address current socio-economic development challenges in Bach Long Vi island district and promote green, sustainable economic growth for the local community.

CRediT author statement

Xuan Sinh Le: Conceptualisation, Methodology, Supervision, Writing, Reviewing and Editing; Van Bach Nguyen: Qualitative data collection and Analysis; Thi Minh Hien Bui: Developing fisheries logistics activities; Manh Hao Do: Developing fisheries logistics activities; Van Thao Nguyen: Building thematic maps; Thi Thu Ha Nguyen: Building thematic maps; Van Tung Pham: Developing experiential tourism; Truong Huynh Nguyen: Developing a set of criteria.

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COMPETING INTERESTS

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

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Application of decision analysis module in water resources allocation of inter-provincial river basins: A case study at the Bang Giang - Ky Cung river basin, Vietnam

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Abstract:

The analytic hierarchy process (AHP) method has been widely applied in numerous studies related to water allocation worldwide. However, in Vietnam, very few works have addressed the determination of priority orders and water allocation proportions using this method. This paper focuses on the application of AHP, integrated into the decision analysis module for Excel tool (DAME), to determine the priority order and proportion of water resource allocation for the Bang Giang - Ky Cung river basin using various input data, such as water usage, production values, growth rates, etc. The results, based on scenarios of socio-economic growth up to 2025 for Cao Bang, Lang Son, and Bac Kan provinces, taking into account four main water user categories (industry, livestock, agriculture, aquaculture), and considering the entire basin, indicate that the highest proportion of water resource allocation is for the agriculture, approximately 34%, followed by livestock at 33%, industry at 22%, and finally aquaculture at 11%. The findings of this paper can serve as a reference for near-future planning to promote the development of water sectors, increase production capacity, and effectively manage water resources to meet socio-economic development targets for the period from 2021 to 2025 in the provinces located within the basin.

Keywords: AHP, DAME, Bang Giang - Ky Cung river basin, water resources allocation.

Classification numbers: 2.1, 7

1. Introduction

Water resources are a pivotal factor, playing a crucial role in ensuring food and energy security, as well as supporting the processes of industrialisation and urbanisation. In recent years, Vietnam has witnessed a notable increase in droughts and water shortages. The conflicts arising from competing water demands, particularly between hydropower plants and the agricultural sector downstream, have become more pronounced. Thus, it becomes imperative to establish a quantifiable framework for determining the priority order and allocation proportions of water resources among various sectors.

Multi-Criteria Analysis methods (MCA) have gained widespread adoption across various disciplines worldwide. AHP has been applied

extensively, incorporating stakeholder participation, in the domain of water resources management. Examples include works such as "A review of the AHP: An approach to water resource management in Thailand" [1, 2]; "Analytical hierarchical process as a decision support tool in water resources management" [3]; "An improved analytic hierarchy process method for the evaluation of agricultural water management in irrigation districts of North China" [4]; and "Making choices in the water allocation for the Lam Pao reservoir Kalasin by analysis hierarchy process" [5]. Additionally, AHP has been utilised for selecting rainfall forecasting models and evaluating alternative management solutions for urban water supply systems through MCA [6, 7].

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However, studies and research on analytical hierarchy and water allocation proportions in Vietnam remain relatively scarce. Most studies have primarily focused on water resource allocation based on efficient water utilisation. The determination of priority order and water allocation proportions, especially in the context of droughts and water shortages, has only been briefly addressed in Article 23 of Circular No. 04/2020/TT-BTNMT, issued on 03/6/2020 by the Ministry of Natural Resources and Environment, which pertains to technical regulations governing the general planning of inter-provincial river basins and water sources.

The AHP method, integrated into the DAME, builds upon the principles of analytical hierarchy by incorporating various criteria (input data) to produce priority orders and allocation proportions for different scenarios and integrated scenarios. This approach introduces a novel perspective on water resources allocation, enabling the quantification of priority orders and proportions in the context of droughts and water shortages, particularly for critical inter-provincial river basins and transboundary river basins.

In this paper, we employ the AHP method, integrated into the DAME, to determine the priority order and allocation proportions among water users in the Bang Giang - Ky Cung river basin. This represents the central objective of our study. Ultimately, the findings of this work can contribute to the socio-economic development of the relevant provinces, alleviate poverty, and enhance social security within the territorial regions. The results presented in this paper will provide valuable support to decision-makers and planners in formulating policies, ensuring water security, and advancing the socio-economic well-being of both the affected provinces and the entire river basin.

2. Study area and input data

2.1. Overview of the study area

The Bang Giang river, also known as the Bang river, originates from Guang Xi province, China, and flows in a northwest-southeast direction into Cao Bang province, Vietnam, near the Soc Giang Border

gate, Soc Ha commune, Ha Quang district, before returning to Guang Xi province, China (Fig. 1). In China, it merges with the Ky Cung river, giving rise to the Ta Giang river (Fig. 1). This river spans a total length of 90 km and encompasses a basin area of 4,000 km². Furthermore, the Bang Giang river basin boasts an annual water volume of approximately 4.34 billion m³. In the dry season, it contains 1.17 billion m³, constituting 27% of the annual volume, while the wet season sees about 3.17 billion m³, accounting for 73%.

The Ky Cung river, situated in Lang Son province, is one of the prominent rivers in the region (Fig. 1). Its source lies in the high mountain region of Bac Xa, within Dinh Lap district, Lang Son province, before it flows into China. The Ky Cung river serves as a major tributary of the Ta Giang river (Fig. 1). In Vietnam, this river spans a total length of 243 km and encompasses a basin area of 6,660 km². It is the sole river in Northern Vietnam that flows in a southeast-

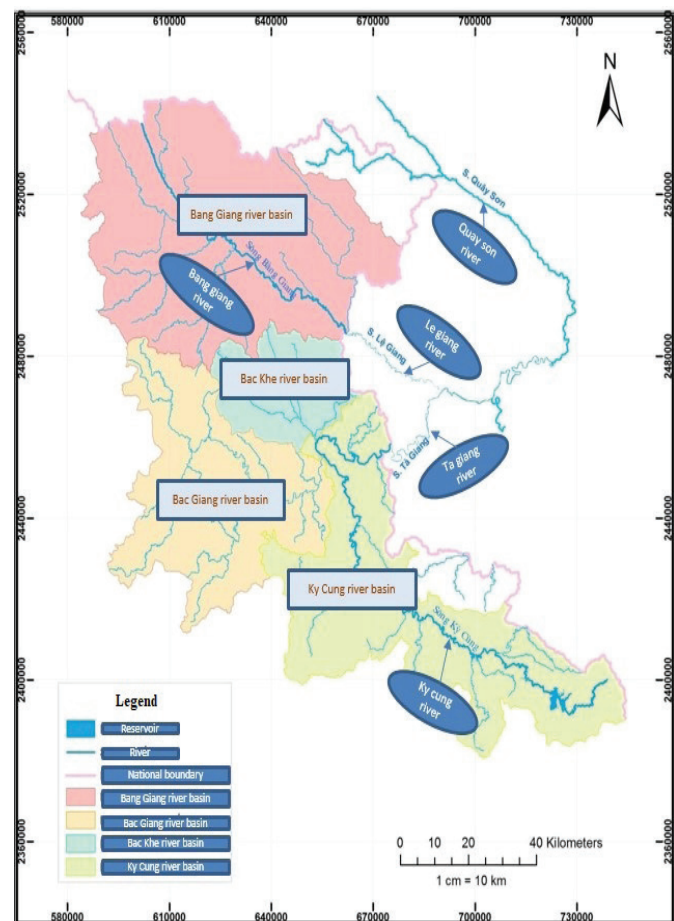


Fig. 1. Map of Bang Giang - Ky Cung river basin.

northwest direction into China. The river comprises three primary tributaries: Bac Giang, Bac Khe, Ba Thin rivers. The Ky Cung river basin has an annual water volume of approximately 1.8 billion m³. During the dry season, it contains 0.39 billion m³, accounting for 21.6% of the yearly volume, while the wet season sees approximately 1.41 billion m³, constituting 78.4% of the annual volume.

With a relatively high potential for water resources, approximately 10.000 m³ per capita, the Bang Giang - Ky Cung river basin ranks among Vietnam's abundant river basins, based on the average water volume per person. Nevertheless, annual water resources are distributed unevenly throughout the basin, particularly during the wet season when water volume ranges from 65-80% of the total yearly water volume. Additionally, groundwater resources are limited and challenging to exploit within this river basin. Situated in a developed economic zone, the basin experiences a significant increase in water demand across various sectors and provinces. The current water demand stands at approximately 465 million m³, with projections indicating a rise to 576 million m³ by 2050, representing a 1,24-fold increase over the present demand. Consequently,

effective water resource allocation within this basin is imperative to balance current and future water demand.

2.2. Input data

In this article, we have taken into account the socio-economic development plans up to 2025 for three pertinent provinces: Lang Son, Cao Bang, and Bac Kan. The baseline year selected for our analysis is 2021, aligning with the Integrated Water Resources Plan for the Bang Giang - Ky Cung river basin, which extends from 2030 to 2050. Our study encompasses four primary water sectors: agriculture, livestock, industry, aquaculture.

Based on the data collected from the river basin situated within the three aforementioned provinces, with particular emphasis on Lang Son and Cao Bang as the principal areas, we have identified four criteria for our analysis. Table 1 provides details pertaining to the four criteria for the four principal water sectors:

- Water utilisation patterns across all water sectors up to 2025 [8].
- Production values associated with diverse fields (water sectors) up to 2025 [9-11].

Table 1. Input data used for the DAME tool.

Province	Criteria/Sector	Water use (mil.m ³)	Production value 2025* (mil VND)	Proportion 2025 (%)	Growth rate 2025 (%)
Cao Bang	Agriculture	142.04	2,571,156.49	11.3	4.7
	Livestock	3.47	2,395,704.06	7.1	4.4
	Aquaculture	4.14	19,824.66	0.1	3.6
	Industry	24.7	531,653.90	36.7	16.7
Lang Son	Agriculture	179.76	7,379,303.57	10.4	5.3
	Livestock	1.8	4,535,644.13	8.7	5.2
	Aquaculture	9.36	80,423.56	1	4.4
	Industry	37.6	1,414,174.71	23.1	20
Bac Kan	Agriculture	55.89	4,168,607.17	20.5	5.1
	Livestock	0.6	1,896,911.17	13.3	4.7
	Aquaculture	5.98	90,174.75	0.3	3.9
	Industry	3.7	811,252.44	22	6.9

*Production values of water sectors based on the equation of economic growth $Y_n = Y_0(1 + Ga)^n$. n: number of criteria.

- The distribution of various water sectors as per the socio-economic development plans of the relevant provinces up to 2025 [12-14].
- The growth rates characteristic of different water sectors, as outlined in the socio-economic development plans of the related provinces up to 2025 [12-14];

3. Method

AHP stands out as one of the most widely employed and popular multi-criteria methods (Fig. 2). AHP is a method that leverages mathematics and psychology to organise and analyse intricate decisions. It was originally developed by T.L. Saaty (1980) [15] in the 1980s and has undergone refinements over time. AHP comprises three essential components: the overarching goal or problem under consideration, the array of potential solutions referred to as alternatives, and the criteria against which the alternatives are to be assessed. AHP furnishes a logical framework for making necessary decisions by quantifying the criteria and alternative options and establishing their relationship with the overarching objective. Rather than relying on extensive datasets, AHP can utilise expert opinions or judgements for analysis. Furthermore, AHP typically entails three core steps: analysis, assessment, and integration. The AHP method facilitates the resolution of questions such as "What are the available alternatives?" or "Which alternative is the most suitable?".

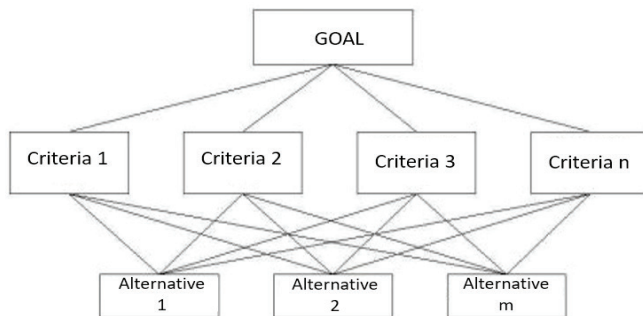


Fig. 2. Schematic representation of analytic hierarchy.

The application of this methodology entails determining the relative weights to be assigned to the criteria in defining the overarching goal. This stage involves pairwise comparisons of the criteria and the assignment of preference. Additionally,

priority levels corresponding to the pairwise criteria comparisons encompass values ranging from 1 to 9, or the inverses of these values (Table 2). Accordingly, two preference values are associated with each pair of criteria, depending on which value takes precedence.

Table 2. Preference levels and corresponding values.

Preference level	Numerical value
Equally preferred	1
Equally to moderately preferred	2
Moderately preferred	3
Moderately to strongly preferred	4
Strongly preferred	5
Strongly to very strongly preferred	6
Very strongly preferred	7
Very strongly to extremely preferred	8
Extremely preferred	9

As mentioned earlier, the DAME is a tool that supports the analytical hierarchy in the decision-making process. DAME has the capability to accommodate a variety of scenarios and decision-makers. The tool provides a display of all calculations conducted during the AHP (Fig. 3). Users can structure their models into three primary levels: scenario, criteria, and variant. These levels can be evaluated using weights or pairwise comparisons. Three distinct methods are available for weighing the criteria, variants, and scenarios, including: the method proposed by T.L. Saaty (1980) [15]; the geometric mean; and the method proposed by B. Agarski, et al. (2012) [16].

Fig. 3. DAME interface used for entering input data.

Figure 3, displayed above, illustrates the fundamental configurations of the tool, including the number of scenarios, criteria, and variants. If users opt not to utilise the scenario feature, they should specify the number of scenarios as 1. In Fig. 3, users can establish scenarios and criteria comparisons either through a pairwise matrix or by directly assigning weights. Furthermore, users have the flexibility to choose how they want to evaluate the variants in accordance with individual criteria, with three options available: pairwise - wherein each individual pair of variants is compared; value max - which shows maximisation based solely on value (e.g., price) for each individual variant; value min - which indicates minimisation based solely on value (e.g., cost) for each individual variant. DAME is seamlessly integrated into the Microsoft Excel platform, rendering it user-friendly and facilitating the resolution of multi-criteria problems.

In the criteria comparison section, users can select values (located in yellow cells) using the drop-down menu, as illustrated in Table 3. It is important to note that values in the other cells are calculated and assigned automatically. If criteria in the rows hold greater significance than those in the columns, users can input values ranging from 2 to 9 (higher values signifying greater importance). Conversely, if criteria in the rows are less significant than those in the columns, users can input values from 1/2 to 1/9 (lower values indicating lesser importance).

Table 3. Criteria comparison setting in DAME.

Criteria	Crit 1	Crit 2	Crit 3	0.000	Criteria weights
Crit 1	1				0.333333
Crit 2	0	1			0.333333
Crit 3	0	0	1		0.333333

If criteria in the rows are of roughly equivalent importance to those in the columns, users can input a value of 1 or leave it at the default setting. Additionally, it is crucial to ensure that the conflict index, situated in the upper right corner of the matrix, remains below 0.1. If it surpasses this threshold, adjustments are necessary. Apart from the criteria matrix, the criteria weights must also be specified. This column displays the weight assigned to each individual criterion, based on the values designated in the matrix. Consequently, the weights are computed using the following equation:

$$w_k = \frac{\left(\prod_{j=1}^n a_{kj} \right)^{1/n}}{\sum_{i=1}^n \left(\prod_{j=1}^n a_{ij} \right)^{1/n}}, \quad k = 1, 2, \dots, n$$

where w_k is the weight of criterion k (variant), a_{ij} is value of the matrix of pairwise comparison, n is the number of criteria (variants), a_{kj} is value of criterion k in the matrix of pairwise comparison.

The global conflict index (GCI) index is computed as below:

$$GCI = \frac{2}{(n-1)(n-2)} \sum_{i < j} \log^2 \left(a_{ij} \cdot \frac{w_j}{w_i} \right)$$

where n is the number of criteria, W_i : weight of criteria in the i -th row, W_j : weight of criteria in the j -th column, a_{ij} : value in the pairwise comparison of the i -th row, j -th column.

Once values are entered into the matrix of pairwise comparison, all the weights are recalculated immediately, enabling a clear observation of the impacts of individual pairwise comparisons. The tool also provides matrices and graphs of total variants. The vector of weights of variants Z is computed using the following equation:

$$Z = W_{32} W_{21}$$

where W_{21} is the matrix of dimensions $n \times 1$ (vector of criteria weights)

$$W_{21} = \begin{bmatrix} w(C_1) \\ \vdots \\ w(C_n) \end{bmatrix}$$

and W_{32} is the weight matrix of dimensions $m \times n$

$$W_{32} = \begin{bmatrix} w(C_1, V_1) & \dots & w(C_n, V_1) \\ \vdots & \dots & \vdots \\ w(C_1, V_m) & \dots & w(C_n, V_m) \end{bmatrix}$$

where $w(C_i)$ is the weight of criterion C_i and $w(C_i, V_j)$ is the weight of criterion C_i corresponding to variant V_j .

4. Results and discussion

4.1. Water allocation criteria requirements

The criteria for water allocation, intended to determine the priority order and allocation proportions, were established based on the water requirements and socio-economic development plans of the relevant provinces within the Bang Giang - Ky Cung river basin. These criteria serve as the constraints guiding the primary objective, which is the equitable and optimal allocation among water users. Table 4 provides an overview of the criteria and constraints configured within DAME.

Table 4. Allocation criteria and constraints set up in DAME.

Criteria	Water use	Production value	Water sectors proportion	Water sector growth rate
Objective function	Minimum	Maximum	Pairwise comparison	Pairwise comparison

4.2. Results of water allocation rights

To assess water allocation rights and water distribution within the Bang Giang - Ky Cung river basin, considering the perspectives and opinions of the provinces, three planning scenarios were formulated for the 2020-2025 period. These scenarios revolved around (1) Cao Bang province, (2) Lang Son province, (3) Bac Kan province, with the scenario weights being computed based on the Provincial Competition Index (PCI) (Table 5). This index encompasses ten sub-indices employed to evaluate the weights: 1. Market enrolment, 2. Land use approach and stability, 3. Transparency, 4. Time cost, 5. Other costs, 6. Proactive and pioneering characteristics of leaders, 7. Fair competition, 8. Support service for business, 9. Labour training, and 10. Governance. Fig. 4 illustrates the Decision Analysis module for calculating scenario weights. The Saaty method was utilised to assess criteria weights. The table below presents the outcomes of the weights and the PCI index for the scenarios.

Table 5. Scenario weights and the PCI of scenarios.

Scenario	Weight	PCI
Lang Son	0.35	67.88
Cao Bang	0.31	59.58
Bac Kan	0.34	65.15

Decision Analysis Module for Excel. Number of scenarios = 3, Number of criteria = 4, Number of variants = 4

Names of scenarios:			
Lang Son	Cao Bang	Bac Kan	
Names of criteria:			
Water use	Production value	Water sector proportion	Growth rate
Names of variants:			
Agriculture	Livestock	Aquaculture	Industry
Criteria weights evaluation method:			
Method	Saaty method		
Scenarios comparison:			
Scenarios	Value		Scenarios weights
Lang Son	67.88		0.35
Cao Bang	59.58		0.31
Bac Kan	65.15		0.34

Fig. 4. Screenshot of the Decision Analysis module in DAME.

The results indicate that Lang Son province achieved the highest PCI index among the three provinces, with a score of 67.88. Consequently, the water allocation right for this province is 0.35. Bac Kan secured the second position with a PCI of 65.15 and a water allocation right of 0.34. Finally, Cao Bang recorded a PCI of 59.58, accompanied by a water allocation right of 0.31. These results demonstrate that the three provinces within the Bang Giang - Ky Cung river basin obtained similar water allocation rights for the 2020-2025 period. This can be attributed to their shared natural characteristics and socio-economic conditions.

4.3. Results of priority order and water allocation proportion

4.3.1. Results of priority order

After establishing the criteria for comparison and calculating the priority order and water allocation proportions in line with the socio-economic development plans up to 2025 of the three provinces, this information was incorporated into the DAME Tool. It facilitated the computation of water allocations and sharing ratios for water users situated within the Bang Giang - Ky Cung river basin.

The input data integrated into the DAME model for scenario determination of priority objects and optimal allocation and sharing rates included the following:

- Primary water users: cultivation, livestock, industry, aquaculture.

- Evaluation criteria: 1. Water consumption; 2. Production value; 3. Water sector proportion; 4. Growth rate.

The paired criteria for prioritisation utilised an expert-based approach, with representatives from the Departments of Natural Resources and Environment, the Department of Agriculture and Rural Development, and the Department of Industry and Trade. These experts were consulted to collect their opinions and to compare criteria based on the current status and the developmental orientation of each province within the Bang Giang - Ky Cung river basin up to 2025. The following section presents the results of this expert-based comparison (Tables 6, 7).

Table 6. Weights of criteria for three related provinces (Lang Son, Cao Bang, and Bac Kan)*.

Criteria	Lang Son				
	LDN**	GTSX***	TT****	TDIT*****	Weight
LDN	1	1	1/3	1/3	0.14
GTSX	1	1	1	1	0.24
TT	3	1	1	1	0.31
TDIT	3	0	1	1	0.31
	Cao Bang				
	LDN	GTSX	TT	TDIT	Weight
LDN	1	1/3	1/2	1/3	0.11
GTSX	3	1	1	1	0.30
TT	2	1	1	1	0.28
TDIT	3	1	1	1	0.30
	Bac Kan				
	LDN	GTSX	TT	TDIT	Weight
LDN	1	1	1/2	1/3	0.16
GTSX	1	1	2	2	0.34
TT	2	0.5	1	1	0.23
TDIT	3	0.5	1	1	0.27

*The evaluation form includes three pairwise comparison evaluation forms representing three departments: the Department of Natural Resources and Environment, the Department of Agriculture and Rural Development, and the Department of Industry and Trade in Cao Bang, Bac Kan, and Lang Son.

**Water use

***Production value

****Water sector proportion

*****Growth rate

Table 7. Results of water users versus setup criteria in DAME .

Water user	Lang Son			
	Water use (Minimum)	Production value (Maximum)	Water sector proportion (Pairwise comparison)	Growth rate (Pairwise comparison)
Agriculture	0.008	0.550	0.284	0.331
Livestock	0.800	0.338	0.203	0.241
Aquaculture	0.154	0.006	0.040	0.241
Industry	0.038	0.105	0.474	0.188
	Cao Bang			
	Water use (Minimum)	Production value (Maximum)	Water sector proportion (Pairwise comparison)	Growth rate (Pairwise comparison)
Agriculture	0.012	0.466	0.253	0.336
Livestock	0.499	0.434	0.225	0.205
Aquaculture	0.418	0.004	0.044	0.231
Industry	0.070	0.096	0.478	0.227
	Bac Kan			
	Water use (Minimum)	Production value (Maximum)	Water sector proportion (Pairwise comparison)	Growth rate (Pairwise comparison)
Agriculture	0.013	0.598	0.370	0.289
Livestock	0.705	0.272	0.224	0.289
Aquaculture	0.111	0.013	0.035	0.246
Industry	0.172	0.116	0.370	0.175

4.3.2. Results of priority order and water allocation proportion

Figure 5 displays the outcomes regarding the priority order and water allocation proportion, encompassing three scenarios aligned with the planning of the three provinces in the basin, as well as a general scenario designed for the entire basin, as defined in DAME.

The results based on the priority order and allocation proportion, considering four criteria (water use, production value, water sector proportion, and growth rate), unveil specific allocations for each province and the basin as a whole. Lang Son province, with its distinctive agricultural economic structure, is gradually shifting towards increasing the proportion of livestock while reducing agriculture, resulting in a priority allocation of 33% for livestock, followed by 32% for agriculture, 24% for industry, 11% for aquaculture. Cao Bang province, with promising opportunities in agriculture, particularly for high-value endemic crops (for example, chestnuts, squash, tea, essential oil products, honey, wild

mushrooms, sticky rice), assigns the highest priority of 32% to agriculture, followed by 31% for livestock and the remainder for industry. Bac Kan province, endowed with natural characteristics conducive to agriculture and forestry, allocates priority orders of 37% for agriculture, 34% for livestock, 20% for industry, and 10% for aquaculture. Lastly, for the Bang Giang - Ky Cung river basin, the priority order for water allocation is 34% for agriculture, 33% for livestock, 22% for industry, 11% for aquaculture.

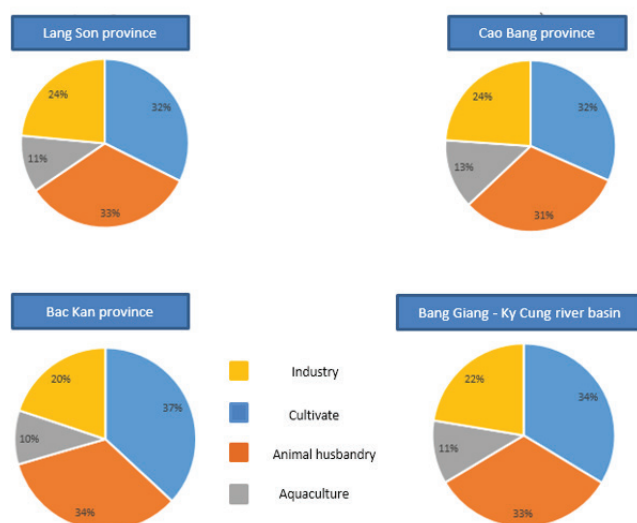


Fig. 5. Results of water allocation proportion corresponding to different scenarios in the Bang Giang - Ky Cung river basin.

In summary, the Bang Giang - Ky Cung river basin is acknowledged as one of the most water-abundant river basins, boasting an approximate water availability of 10,000 m³ per capita. Nevertheless, it is imperative to frequently update the water allocation proportions to align with the socio-economic development objectives of the related provinces and to adapt to the challenges posed by climate change. The basin faces the complexities of climate phenomena such as El Nino and La Nina, which can significantly impact its hydrological dynamics in the present and future.

5. Conclusions

This paper has presented various scenarios and employed DAME tool, underpinned by the multi-criteria analysis AHP method within the Excel platform, to determine the priority order and

allocation proportion for water resources. These scenarios have been tailored to the unique natural characteristics and socio-economic development orientations of the three local provinces, encompassing industry, agriculture, livestock, and aquaculture sectors.

The results derived from the water allocation scenarios for the entire basin have underscored the need to accord the highest priority to agriculture at 34%, followed closely by livestock at 33%, industry at 22%, and aquaculture at 11%. Consequently, to effectively utilise water resources and align with the socio-economic development orientations of each province for the five-year period spanning 2021 to 2025, it is imperative to formulate policies that foster the robust growth of agriculture and livestock production, as well as other productive cultivation and water sectors.

However, it is essential to acknowledge the inherent uncertainty in this method, which may not yield entirely optimal evaluation results. To address these limitations, various studies have proposed solutions that integrate AHP with fuzzy logic, giving rise to the Fuzzy Analytic Hierarchy Process (F-AHP) for pairwise comparisons. These advanced methodologies offer promising avenues for further research and exploration.

CRediT author statement

Hung Anh Nguyen: Conceptualisation, Methodology, Revising; Quoc Viet Tran: Writing - Reviewing, and Editing; Xuan Manh Trinh: Writing - Reviewing, and Editing; Duc Quy Luong: Conceptualisation, Methodology.

COMPETING INTERESTS

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

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A computational approach to transparency in corporate governance across borders

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Abstract:

This article delves into the intricate relationship between information asymmetry and financial reporting comparability, with a particular emphasis on earnings management (EM) in cross-border corporate governance settings. Utilising data from 2,475 non-financial firms across 19 frontier markets from 2003 to 2019, the study employs pooled OLS, fixed effects, and between-effects models to scrutinise the impact of factors like financial comparability, reputable auditing, analyst coverage, and legal systems on earnings management. The findings reveal that enhanced financial comparability, facilitated by strong governance mechanisms such as reputable auditors and analyst coverage, leads to a reduction in earnings management and information asymmetry. Interestingly, leverage does not serve as a constraining factor as commonly believed. The results contribute to the growing body of literature on the application of data science, and challenge the pecking order theory (POT), while lending support to the knowledge-based view (KBV) and convergence theories, thereby offering valuable insights into the role of corporate governance in mitigating information asymmetry.

Keywords: accounting comparability, accruals earnings management, frontier markets, information asymmetry.

Classification number: 2.2

1. Introduction

With the global business transactions, ensuring transparency in corporate governance has become a critical factor. In this context, addressing the issue of asymmetric information is of the greatest concern, given it can lead to higher financing and transaction costs and market failure if market participants make poor financial decisions. Enhancing comparability, a key qualitative characteristic of financial statements, helps mitigate the negative effects of asymmetric information by enabling users to evaluate financial performance across firms. This approach assists shareholders in making rational decisions, promotes accurate analysis of economic indicators [1], guides policy responses and improves information quality [2].

To understand how information asymmetry affects markets, it is necessary to analyse the issue in the context of various economic challenges. Analysing asymmetric information within the context of various economic challenges provides valuable insights into the efficiency of markets. This is because asymmetric information allows certain market participants to access private knowledge [3, 4]. The KBV theory posits that private information is the

most significant source of competitive advantage [3-5]. To retain their competitive advantage, managers can either gather or suppress negative data and may also employ EM methods as proposed by [6]. The negative consequences of EM are similar to those of asymmetric knowledge, as it can compromise the decision-making process and result in long-term declines in value [7] if funding providers become hesitant. Furthermore, EM also suppresses relevant information, thereby reducing the information content of financial reports and causing reductions in economic efficiency [8]. Reduced financial reporting volume negatively impacts the quality of accounting information and raises doubts about a firm's sustainability [9].

Despite existing research, the role of accruals-based EM (AEM) in exacerbating information asymmetry remains poorly understood, particularly in under-researched frontier markets. Addressing this gap, the central research question of this study is: How do governance mechanisms and financial comparability influence information asymmetry and EM? This overarching question is further dissected into five sub-questions focusing on specific governance and firm factors that could constrain EM.

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Our initial findings indicate that high financial comparability is inversely related to accrual earnings management (AEM) and, consequently, to information asymmetry. This relationship is further strengthened by governance mechanisms such as audit quality, analyst following, and firm leverage, which act as constraining factors on EM. These mechanisms enhance the quality of information disseminated, aiding investors in more accurately assessing a firm's financial performance¹.

Building on this, the study shows that firms with robust comparability metrics are less likely to engage in AEM, thereby reducing information asymmetry. Effective corporate governance practices, including high-quality audits and increased analyst following, serve as additional constraints on EM. These practices not only improve the quality of disseminated information but also simplify the task for investors in evaluating a firm's relative financial performance¹.

Conclusively, this research illuminates how the interplay between financial comparability and governance mechanisms, such as BigN auditors and analyst following, effectively mitigates information asymmetry. Interestingly, leverage does not deter opportunistic EM behaviour, challenging conventional wisdom. The theoretical implications include a critique of the pecking order theory (POT) and a reinforcement of the knowledge-based perspective. From a practical standpoint, the study underscores the importance of enhanced comparability and governance in emerging markets. It also cautions against the universal applicability of findings from other markets. In addressing the challenges posed by these frontier markets, particularly the inconsistent data presentation from the 2,475 companies investigated, the study navigated these complexities with rigorous and systematic analysis. Overall, this study, using a methodological approach of comparative regression analysis, significantly enriches the literature on information asymmetry and comparability, offering a nuanced understanding that can guide more efficient markets and better financial decision-making.

The progression of this study is as follows. A review of prior literature and the development of hypotheses are presented in Section 2. The research designs and data are described in Section 3, followed by a presentation of the theoretical framework in Section 4. Empirical results are presented and discussed in Section 5, and the study concludes with practical and theoretical implications in Section 6.

¹The difference due to accounting effects or firm fundamentals.

2. Background, related literature, and research question

2.1. Characteristics and challenges of frontier markets and their firms

Frontier markets are characterised by moderate market openness to foreign ownership, limited capital movement, and modest operating efficiency, rendering them less economically mature than developed markets [10]. In these markets, information asymmetry, exacerbated by herding—an evolving market feature—impairs the dissemination of fundamental information [11]. Asymmetric markers lead to price formation based on limited information, supporting the argument that frontier markets lack depth. Despite comprising over 20 percent of the world's population, the aggregate value of frontier markets is less than 0.3 percent of global markets [12]. The characteristics of frontier markets and firms include: (1) A lack of strong inter- and intra-market correlation in frontier firms, often due to the practice of cross markers, where companies list shares on multiple stock exchanges in different countries [13]; (2) Higher ownership concentration and lower investor protection levels in frontier market equities; (3) The effectiveness of diversifying into frontier equity markets, as evidenced by strong hedging, high portfolio returns, and minimal investment losses [14]; and (4) The role of financial statements in enabling investors to gain a better understanding of a company's performance and management activities across various stages of country development, thereby increasing the volume of available information [10].

2.2. Financial comparability

Market policies and monitoring pressure drive firms toward high-fidelity practices, causing decreased information asymmetry and acquisition costs. Pressure, as a result of monitoring and increases in financial statement comparability, brings about increases in the quantity and quality of information available to corporate outsiders. Financial comparability is the extent to which transactions similar in content and form are treated alike. The Financial Accounting Standards Board's (FASB) conceptual framework prescribes comparability as a crucial quality of financial statements that help investors compare information between firms and evaluate alternative opportunities [15]. Comparability facilitates the detection of opportunistic managerial behaviour and reduces information processing costs for investors and monitoring agents.

Various factors drive comparabilities, such as effective audit committee attributes, auditor quality, competition, and product differentiation. Additionally, accounting standards and regulations such as IFRS affect comparabilities.

Understanding what factors influence comparability is crucial because it improves the quality of available information and reduces the costs associated with acquiring that information.

When comparability increases, the information quality and quantity of a firm's financial report are more readily interpreted. Empirical studies have confirmed that the benefits of comparability in financial report interpretation include more efficient capital allocation, reduced information asymmetry, reduced risk-taking, economised cash holdings, improved forecast accuracy, and a decreased managerial incentive to hoard bad news [16].

S. Franco (2021) [17], W. Martens, et al. (2023) [18] argue that managers try to gain legitimacy for their strategic imperatives by mimicking the strategies and policies of larger and more established peers in the industry. Particularly, companies' financial statements are more comparable to those of their industry counterparts in the same metropolitan region than those elsewhere. This is because competition acts as a corrective mechanism, enhancing comparability and decreasing agency costs. E. Delbufalo, et al. (2018) [19], J.P. Martin, et al. (2001) [20] back up this conclusion.

When a firm's information environment and accounting comparability are higher, opportunistic AEM behaviour decreases [21]. Research on the linkages between comparability and information asymmetry in frontier markets is sparse because the concentrated firm ownership structure in emerging Asia and Latin American markets hampers performance comparison. Despite noted issues with a concentrated ownership structure, comparability helps resolve principal-ownership issues [22]. M. Bjornsen, et al. (2022) [23] stated it is imperative to consider the associated consequences, namely EM, when conducting a comparability analysis.

2.3. Earnings management

EM is a practice that enables insiders to obtain private benefits by presenting misleading financial data. However, such opportunistic behaviour can negatively affect the company's value and ultimately ruin the interests of creditors and minority shareholders. Accounting comparability is a factor that can reduce the agency cost associated with the incentives to hold negative information and conceal the company's poor performance. Better accounting comparability also increases labour investment efficiency and reduces the costs of monitoring and governing for various stakeholders. While the adoption of IFRS has resulted in enhanced information environments and less manipulated earnings in some jurisdictions, many economies still adhere to national standards. AEM, which develops when financial information is creatively managed to influence decision-making, is distinct from fraud and is not regarded as fraudulent if set by accounting standards [24]. Individual characteristics

such as gender, age, professional experience, educational qualifications, and training area influence the perception of how simple it is to implement and detect AEM practices in financial statements [25].

Due to the failures of economic enterprises and the credibility concerns surrounding accounting as an authentication system, AEM has generated many studies. The relationship between accounting standards and practices and economic crises has been established, and financial controversies have occurred in the United States, Europe, and elsewhere. The findings underscore the need to limit unethical behaviour and instil ethical values in the next generation of accounting, management, and auditing professionals.

Increases in financial disclosure quality are crucial in minimising information asymmetry; however, information asymmetry is heightened when a corporation participates in EM. EM is a process through which a company's performance is manipulated for short-term gain. Managers may manage earnings to avoid losses, achieve predetermined profit levels, meet previous management earnings forecasts, or influence stock returns [26]. A consequence of EM is that reported financial results may not truly reflect the economic and financial realities [27]. While not all EM is opportunistic, companies in less-developed markets have a greater propensity to manage earnings than those in developed economies [28], thereby increasing information asymmetry. A firm's accruals are increasingly seen as a measure of its performance and a technique for managing earnings. However, the reversible nature of accruals limits a manager's ability to make biased estimates continually. Because managers can choose accrual techniques to enhance accounting's information value, a compelling case can be made that managers may also engage in reporting processes in their best interest. Advanced AEM monitoring systems have increased the detection of AEM activity, aided in uncovering financial reporting irregularities, and decreased information asymmetry [29]. Furthermore, corporate governance practices that promote transparency and accountability in financial reporting and effective internal controls can significantly reduce information asymmetry and encourage ethical behaviour [30].

2.4. Firm leverage

A positive association exists between informational asymmetry and leverage. M.Z. Frank, et al. (2003) [31] suggested that debt is favoured over equity when external financing is required due to its lower information costs and ability to avoid equity-associated agency costs. Debt financing imposes disciplinary constraints on management by reducing cash for non-optimal expenses, as cash is needed for debt repayment. Additionally, highly leveraged companies face increased monitoring by bankers and

creditors [32]. Although a positive association exists between information availability and leverage, leveraged firms are more likely to engage in EM activities. A levered firm may adopt accounting policies that increase income to comply with the lender-imposed debt covenants. Information asymmetries due to EM are less severe for firms with large loans as borrowing information costs are less of a barrier. M.L. DeFond, et al. (1994) [33] found that managers often engage in EM to prevent adverse lending effects. It was also found that firms experiencing financial distress and those with failed agreements have an increased likelihood to manage earnings [34]. Conversely, Y. Li, et al. (2016) [35] found that increased leverage is associated with decreased EM, a relationship influenced by firm growth. As robust institutional environments reduce the negative association between information asymmetry and the adverse consequences of leverage, the association between leverage and comparability is a logical extension of this study.

2.5. External audit quality

External audit firms must have knowledge of industry-specific regulations and standards, as well as the ability to audit complex financial instruments and determine the fair value of assets and liabilities, to conduct high-quality audits of the financial statements of publicly traded companies. If an audit firm lacks this knowledge or proficiency, it can result in a loss of confidence among stakeholders in the financial statements, leading to adverse outcomes such as a decline in stock prices or difficulty securing financing. In addition, external audit firms play a vital role in assuring investor protection and enhancing the quality and distribution of reported information.

In all levels of country development, increased audit quality is affiliated with greater investor protection, legal enforcement, and earnings quality. The findings imply that auditors act as a management constraint mechanism [36] and increase the quality and distribution of reported information. Conventional thinking suggests that Big-N auditors² will ensure greater caution in client financial accounts. BigN's enforcement and prudence fare well in response to investor protection establishments' need for rigor, such as stakeholders' power to bring legal action against auditors for negligence or regulatory bodies disciplining auditors for delinquency [37]. C.L. Becker, et al. (1998) [38] found that non-Big-N auditors' clients are more engaged in revenue-enhancing EM than the clients of non-Big-N auditors. More recently, however, M. Tsipouridou, et al. (2012) [39] found no statistically significant association between EM activities

of firms audited by BigN and those that were not. In an investigation on the external auditor's role in EM following IFRS adoption by a firm, B.V. Tendeloo, et al. (2005) [40] found that, although EM practices generally increased, EM decreased significantly when audited by a BigN audit firm. The authors acknowledge that external auditors may not adequately explain the observed phenomenon, implying that other corporate governance factors may also play a role. Consequently, the relationship between corporate governance practices and auditors' effectiveness in controlling management behaviour and assuring the quality of financial reporting is essential for fostering investor confidence and protecting their interests.

2.6. Analyst following

The relationship between analysts and publicly available information is critical to corporate governance. Analysts play a crucial role in disseminating information to the public, bridging the knowledge gap between firms and market participants. Previous research has demonstrated the significance of analysts in providing information to market participants by investigating the relationship between analyst following and various measures of market liquidity (e.g., see [41]). Analyst following is a proxy for the amount of publicly available information, as determined by the prediction dispersion findings. Greater volumes of publicly available information bolster the notion that analysts help disseminate information to the general public, bridging knowledge gaps between firms and market participants. The extent to which consistent financial reporting reduces an analyst's informational expenses may indicate the value of consistent financial reporting, resulting in reduced information asymmetry. The relationship between analysts and publicly available information may depend on how analysts disseminate information to market participants. If analyst information is rapidly communicated to many market players, a large number of analysts following and concentrated analyst projections combine to create an excellent information environment for uninformed or partially informed market participants. While the role of analysts in bringing information to the public provides numerous advantages, research has also shown that firms increased EM activities when facing increased pressure to meet or exceed analysts' and investors' expectations [42], thereby reducing information transparency. Further, W. Martens, et al. (2021) [43] also found an inverse relationship between EM and analysts following. The inverse relationship is rationalised to result from outsized media and analyst coverage, factors often present around large companies. An analyst's role in restricting EM is inconclusive, yet, when financial statement users are presented with analyst-organised information, users make better decisions [44]. From the above, analysts' influence is inconclusive in their ability to reduce asymmetric information.

²In 1997, the accounting world experienced a major upheaval with the mergers of four of the Big Six accounting firms, forming what is now known as the Big-4 or Big-N.

2.7. Research questions

Based on the arguments presented above, it is anticipated that mitigation of information asymmetry can be achieved through increased comparability of financial statements. Furthermore, it is expected that the quality of financial statement information can be enhanced through governance mechanisms such as improved audit quality and constraints imposed by lenders. These mechanisms are likely to lead to a reduction in earnings manipulation. Additionally, good corporate governance practices, such as transparency and accountability in financial reporting, can play a crucial role in reducing information asymmetry and promoting ethical behaviour. In light of current literature discussions, the research questions (RQs) are formalised as follows:

RQ1: Managerial constraint through financial comparability reduces information asymmetry.

RQ2: Managerial constraint through increased firm leverage results in reduced information asymmetry.

RQ3: Managerial constraint through greater audit quality (as proxied by BigN) results in reduced information asymmetry.

RQ4: Managerial constraint through a greater number of analysts following a firm results in reduced information asymmetry.

RQ5: Information asymmetry lessens managerial constraints and encourages EM.

These questions will illuminate conceptual and empirical discussions on the role of comparability on information asymmetry in frontier markets. The examination of this relationship will provide a deeper understanding of the conceptual and empirical discourses surrounding the topic. The findings of this study will contribute to the ongoing discussion on governance mechanisms and provide additional insights into frontier markets.

3. Theoretical framework

This study is grounded in multiple theoretical frameworks that focus on enhancing decision-making and reducing asymmetric information. Foremost among these is the Symbolic Convergence Theory, as proposed by E.G. Bormann (1985) [45]. This theory is advantageous as it suggests that mass action occurs when individuals with similar wants, values, and goals come together. The concept is further extended by the argument that homogeneity results when individuals face comparable limitations. While this may be perceived as disadvantageous, it is proposed that when managers are constrained in their self-interest, the reliability of available information increases with mass participation.

The modified POT, proposed by S.C. Myers (1984) [46], serves as the second theoretical foundation of this research. According to POT, firms do not maintain a specific target capital structure, but they do prefer internal financing

over external financing. External financing is viewed as a means to increase the informativeness of earnings since it restricts managers from acting solely in their self-interest. In particular, external debt reduces free cash flow, thereby limiting managerial control over fund flows. However, these restrictions and limitations decrease the managerial capacity to conceal inefficiencies, leading to reduced asymmetric information, which is advantageous.

Knowledge is a crucial element that enables firms to sustain competitive advantages and outperform competitors. Thus, the KBV theory, proposed by R.M. Grant (1996) [47], serves as the third theoretical foundation for this research. According to this theory, the asymmetry of information between firm insiders and outsiders represents a strategic disadvantage for the latter. The theory is utilised to argue that increasing knowledge through improved comparability in reporting expands strategic resources, reduces gaps in asymmetric information, and optimises decision-making [48].

Furthermore, it can be argued that sound corporate governance practices, such as transparency and accountability in financial reporting, play a crucial and advantageous role in reducing information asymmetry between insiders and outsiders, aligning with a key aspect of the KBV theory. This aligns with the assertions of R.M. Grant (1996) [47], who emphasises the importance of access to information and knowledge as essential resources for organizations to sustain competitive advantages.

Drawing from the distinct tenets of the Symbolic Convergence Theory, the POT, and the KBV, emerge a unified academic perspective that underscores the collective endeavour of these theories to mitigate information asymmetry. Although each theory originates from its unique vantage point, its confluence highlights the pivotal role of alignment, oversight, and transparency in bridging informational divides. This interplay reinforces the imperative for structured constraints, diligent oversight, and transparent reporting, enhancing the integrity and accessibility of information crucial for informed decision-making. The interplay is illustrated in Fig. 1.

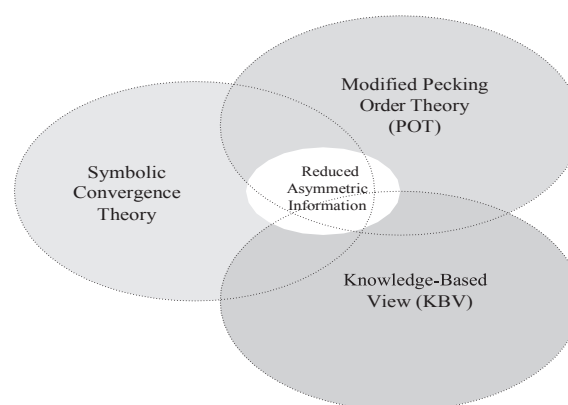


Fig. 1. Convergence of theoretical frameworks.

4. Research design

4.1. Comparability measures

In financial accounting literature, the research on comparability by G.D. Franco, et al. (2011) [49] using quarterly US stock data is considered a seminal study. M.E. Barth, et al. (2012) [50] subsequently modified the comparability method proposed by G.D. Franco, et al. (2011) [49] to evaluate firms using multiple accounting standards (US GAAP and IFRS) in cross-sectoral settings. Given the difficulty of obtaining quarterly data from listed frontier market firms, W. Martens, et al. (2020) [51]'s adaptation of earlier comparability methods using annual data adds robustness, for it produces multiple counter-samples based on specific country-industry factors, despite differing accounting standard regimes.

Using a five-step procedure, our analysis examines the financial comparability of companies across various countries and industries. It estimates a company's fitted stock return, the fitted stock return under each counter-sample model, the absolute value of the difference between the within-sample and counter-sample fitted stock prices, and the comparability score by multiplying the median absolute difference between the fitted stock prices by the negative natural logarithm. The model employs time-series regression to account for cross-national accounting comparability between firms. Greater values indicate greater comparability. Fig. 2 depicts the method for determining comparability, and a thorough breakdown of the entire procedure is available in Appendix A.

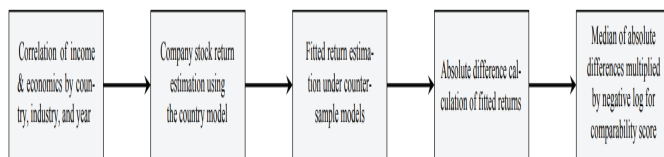


Fig. 2. Comparability model.

4.2. Accruals manipulation

According to S.P. Kothari, et al. (2005) [52], the examination of discretionary accruals through commonly used proxies is incorrectly specified when samples include firms with extraordinary performance. Given that the firms under examination exhibit a significant standard deviation of returns, the method proposed by C. Leuz, et al. (2003) [53] for detecting EM through accruals (AEM) is utilised. Specifically, a composite measure of AEM is calculated to indicate the extent of revenue management through accruals. The calculation of accruals is outlined in Appendix B.

4.3. Regression composition

When information asymmetry is high, shareholders lack the necessary information to supervise management's actions. In environments of considerable information asymmetry between management and shareholders, management can manipulate earnings to a greater extent than in minimal asymmetry environments. As a result, it is predicted that there is a positive relationship between the level of information asymmetry and the extent of EM.

The empirical model used to examine Hypothesis H1-H5 is presented in Equation 11. The study follows the approach of B.C. Sohn (2016) [54] and uses the mean value of the firm-specific comparability scores for target firm i 's to their peers with the same 2-digit SIC code. This process tends to be a benchmark of comparable firms used by acquisition analysts to evaluate a target firm's accounting information.

$$EM_{it} = \gamma + \gamma_1 CmpreScore_{it} + \gamma_2 Analyst_{it} + \gamma_3 BigN_{it} + \gamma_4 Leverage_{it} + \sum \gamma_5 Control Variables_{it} + \sum_i \delta IND + \sum_i \delta YEAR_t + \epsilon_{it} \quad (11)$$

where EM_{it} represents the accruals EM variable of firm i at time t .

4.4. Control variables

Firm-specific control variables are included to isolate the relationship between this study's hypotheses and confounders. The first control variable included is the book-to-market ratio (B/M) to control for firm size. Return-on-assets (ROA) and its absolute value (ROA) control for resource efficiency. Cash flow from operations (CFO) is a function of the accrual adjustment process that transforms cash into earnings and provides additional insight into accruals; we, therefore, include CFO scaled by total assets (CFO/A), and its absolute value (CFO/A). Share return (Return) controls for 'rent efficiencies' and market concentration (as suggested by industrial organization theory [55]). Also included in the model dichotomous

Table 1. Variable definition and predicted relationship with EM.

Variable	Definition	Predicted Relation
EM	The accruals earnings management score is computed using the model developed by C. Leuz, et al. (2003) [58]	
CmpreScore	Comparability for company i and other companies in the same two-digit SIC in a particular year [56].	-
Analyst	Calculated as one's natural log plus the sum of analysts following an entity. Source: Datastream.	-
BigN	BigN, calculated as the number of firms audited by Big 4 or 5 auditors divided by the number of firms by country. Source: Datastream	-
Leverage	Leverage is calculated as total liabilities scaled by total assets. Source: Datastream	-

Source: Authors.

Table 2. Sample distribution.

Panel A			Panel B				Panel C				
By year			By Country				By industry				
Year	N	%	Country	N	Freq.	%	Law	IFRS	Industry	N	%
2003	568.0	23.0	Argentina	92.0	692.0	2.0	††		Oil & Gas	1297	4.7
2004	90.0	3.6	Bangladesh	25.0	1286.0	7.0	†		Food Products	1825	6.6
2005	122.0	4.9	Bulgaria	235.0	2488.0	8.7	††	▲	Paper and paper products	2926	10.6
2006	48.0	1.9	Croatia	305.0	1033.0	3.9	††	▲	Chemical Products	1280	4.7
2007	67.0	2.7	Jordan	134.0	1489.0	4.4	††	▲	Manufacturing	13,413	48.7
2008	124.0	5.0	Kazakhstan	15.0	174.0	1.5	††	▲	Transportation	314	1.1
2009	290.0	11.7	Kenya	150.0	166.0	0.4	†	▲	Scientific instruments	181	0.7
2010	395.0	16.0	Kuwait	91.0	1229.0	3.9	†	▲	Communications	1080	3.9
2011	180.0	7.3	Mauritius	38.0	387.0	1.5	††	▲	Durable goods	1248	4.5
2012	101.0	4.1	Morocco	143.0	281.0	0.9	††		Eating and drinking establishments	3883	14.1
2013	135.0	5.5	Nigeria	5.0	1221.0	3.7	†		Health	102	0.4
2014	76.0	3.1	Oman	18.0	940.0	2.6	††	▲			
2015	54.0	2.2	Pakistan	82.0	3510.0	9.2	†				
2016	40.0	1.6	Romania	57.0	3241.0	11.9	††	▲			
2017	53.0	2.1	Serbia	158.0	4221.0	18.7	††	▲			
2018	81.0	3.3	Slovenia	92.0	115.0	0.4	††	▲			
2019	51.0	2.1	Sri Lanka	271.0	2840.0	7.9	††	▲			
			Tunisia	370.0	78.0	0.4	††	▲			
			Vietnam	608.0	2158.0	11.1	††				
Total	2,475	100		2,475	27,549		100			27,549	100

The sample is divided into firms using IFRS (44.29%), US Generally Accepted Accounting Principles (US GAPP) (0.03%), and local standards (55.68%). Following the 2001 market correction and the 2008 financial crisis, several firms were delisted due to bankruptcy or failure to meet the index's requirements. † denotes civil law countries, †† denotes common law adhering countries. IFRS-adhering countries at the time of the study are denoted by ▲. Source: Authors's summary.

variables for loss (*Loss*) if the company incurred a loss, and a dichotomous variable for both industry (*IND*) and year (*YEAR*) effects. Table 1 describes key variables and their predicted relation to EM. Of note, the variables in the table are anticipated to exhibit an inverse relationship with EM.

5. Key descriptive statistics and discussion on empirical findings

5.1. Sample description

The financial data for this study, collected from Refinitiv Datastream, includes listed companies from 19 frontier countries, excluding financial and insurance firms

due to their unique characteristics and regulations³. The sample omits companies with non-standard fiscal year-ends to prevent bias and comprises 2,475 companies with 27,549 firm-year observations across 11 industries. The characteristics of these firms are detailed in Table 2, which is organised into three panels: Panel A shows the yearly count of included firms, Panel B contains company and country data, and Panel C presents industry data along with two-digit SIC codes. Descriptive statistics for key variables like EM, Comparability Score (*CmpreScore*),

³Robust methodologies were used to ensure the study's validity over time.

Leverage, BigN, and Analysts are presented in Table 3. This table not only provides measures of central tendency and variability, such as mean and standard deviation, but also quartile values (Q1, median, and Q3) for each variable. For instance, *EM* has a Q1 of 0.023 and a Q3 of 0.115, *Leverage* has a Q1 of 0.246 and a Q3 of 0.661, *BigN* ranges from 0.000 to 1.000, and *Analysts* has a Q1 of 0.941 and a Q3 of 2.660. These tables collectively lay the groundwork for subsequent analysis.

Table 3. Descriptive statistics of key variables.

	N	Mean	Std Dev	Q1	Median	Q3
EM	27,549	0.089	0.110	0.023	0.055	0.115
CmpreScore	27,549	0.632	1.116	-0.142	0.394	1.637
Leverage	27,549	0.482	0.428	0.246	0.455	0.661
BigN	27,549	0.328	0.506	0.000	0.000	1.000
Analysts	27,549	1.777	1.086	0.941	1.279	2.660

Source: Authors.

In line with W. Martens, et al. (2020) [51], *CmpreScore* shows mean and median values of 0.632 and 0.394. The standard deviation of 1.116 suggests scores are reasonably distributed. The mean for EM (0.089) is quantitatively similar to those reported by B.C. Sohn (2016) [54] and suggests widely varying EM practices. The mean value for other variables examined shows concordance and disagreement from B.C. Sohn (2016) [54]'s US-based. The mean values showing similarities are *Leverage*, and *Analyst*, with the following respective scores: 0.482 and 1.77. *BigN*, with a score of 0.328, is notably lower than the value found in the US-based study.

Table 4 shows the Pearson correlation between the primary variables utilised in Eq. (1). *CmpreScore* has a significant and positive correlation with *AEM* (coefficient of 0.015). *Leverage*, *Analysts*, and *BigN* were all statistically significant and inversely correlated with *CmpreScore*. The significance of these variables validates their subsequent use in the analysis. Following this, Table 5 provides further validation by showing that multicollinearity is not a significant concern as all VIF values are well below the commonly used threshold of 10.

Table 4. Pearson correlation coefficients of key variables.

	AEM	CmpreScore	Leverage	Analyst	Big4
AEM	1.000				
CmpreScore	0.015	1.000			
Leverage	-0.111	-0.073	1.000		
Analyst	-0.018	0.475	-0.022	1.000	
Big4	-0.004	-0.310	0.017	-0.271	1

Source: Authors.

Significance is identified at three levels, 0.05, 0.01, and 0.001, respectively, by using *italics*, **bold** typeface, and **bold italics** typeface.

Table 5. Variance inflation factor (VIF) analysis.

Variable	VIF	1/VIF
ROA	4.52	0.221007
ROA	4.36	0.229586
CFO	3.03	0.330376
CFO	2.75	0.363884
Industry	1.35	0.739802
Loss	1.34	0.746231
Analyst	1.33	0.752461
Leverage	1.10	0.907648
CmpreScore	1.03	0.967094
BigN	1.03	0.968521
Year	1.01	0.990281
B/M	1.01	0.990304
Return	1.00	0.999651
Mean VIF	1.91	

Source: Authors.

1/VIF represents the tolerance of a variable in a regression model. It is the inverse of the VIF.

5.2. Main regression results

To examine the interdependence of comparability and AEM, we apply three regression methods: Pooled OLS (Model 1), Fixed effects (Model 2), and Between Effects (Model 3)⁴. The fixed effects model is helpful for it rules out the contemporaneous correlation of regressors and idiosyncratic errors and the assumption of stable characteristics and regressors is not required. In contrast, the random effects model enables the estimation of

Table 6. Regression analysis of key variables on EM.

Variable	Model 1	Std Err	Model 2	Std Err	Model 3	Std Err
CmpreScore	-0.023***	-0.66	-0.019**	0.05	-0.012**	0.11
Analyst	-0.032***	-3.36	-0.001***	-2.89	-0.004***	-3.75
BigN	-0.045***	-2.81	-0.044***	-2.81	-0.044***	-2.82
Leverage	0.019***	4.14	0.018*	2.16	0.010	1.35
Intercept	0.230***	13.62	1.120***	13.85	0.232***	13.21
Control Variables	yes		yes		yes	
Year	yes		yes		yes	
Industry	yes		yes		yes	
Observations	12026		12026		12026	
Adj R ²	0.188		0.065		0.399	

Source: Authors.

The Table presents coefficient estimates and standard errors. Significance is identified at three levels: 0.05 *, 0.01 **, and 0.001 ***. Year and industry are set as the fixed effects. As suggested by C. Cinelli, et al. (2020) [57], the interpretation of control variables may be limited as they may not have a structural interpretation; therefore, they are presented collectively in this output.

⁴The Hausman test provides a χ^2 of 51.87, significant at 0.01%, signifying that the fixed-effect model is reliable.

Table 7. Regression analysis of AEM on lag comparison score.

	Model 1	Std Err	Model 2	Std Err	Model 3	Std Err
L.CmpreScore	-0.001*	-2.22	0.003*	-1.62	-0.002*	-2.47
Leverage	0.019***	-4.07	0.015	-1.75	0.012	-1.68
BigN	-0.024***	-5.06	-0.200	-4.16	-0.024***	-3.61
Analyst	-0.003***	-3.76	-0.005*	-2.11	-0.004**	-3.15
B/M	0.000	-0.18	0.001*	-2.05	0.000	-0.08
ROA	-0.262***	-16.57	-0.223***	-12.55	-0.347***	-11.70
ROA	0.294***	-18.55	0.25***	-18.55	0.373***	-18.55
CFO/A	0.052***	-8.55	0.050***	-7.11	0.043**	-3.18
Return Intercept	0.083***	-12.66	0.076***	-12.66	0.134***	-12.66
Industry Dummies	-0.025*** 0.002**	-6.11	-0.021*** 0.003**	-4.41	-0.041*** 0.002**	-5.27
Year Dummies	12.681**	-2.95	15.442	-2.94	10.240	-1.13
	yes yes	-0.52	yes yes	-0.77	yes yes	0.72
Obs	10960		10960		10960	
adj.R ²	0.179		0.103		0.276	

The Table presents estimates and standard errors at three significance levels: 0.05 *, 0.01 **, and 0.001 ***. The fixed effects are set as year and industry. The Wooldridge autocorrelation test results in an F-statistic of 1786.826, which is significant at the 0.01% level for the lag comparable score value. The heteroskedasticity score in the Breusch–Pagan/Cook–Weisberg test is 96.46, which is significant at the 0.01 percent level. This implies that the homoscedastic assumption is not accepted.

β with lower sample-to-sample variability by partially pooling information across units. Using between-effects regression illuminates the inference of marginal effects in small samples. Regression results are displayed in Table 6.

EM is inversely related to *CmpreScore*, suggesting that greater comparability decreases EM and thus increases information asymmetry. Leverage reveals a significant and positive association with EM, which is contrary to the expected hypothesis, yet consistent with [58]. Analyst coverage and the use of Big Four auditors are both found to be inversely associated with EM. The results suggest that firms with greater leverage engage in increased EM activity, whereas a greater presence of analysts following a firm inhibits it. Additionally, the use of Big Four auditors attenuates EM activity, which aligns with prior studies such as [59] in emerging markets. Having controlled for factors such as resource efficiency, firm size, cash flow, losses, and returns, the main variables of this study point to areas that restrict EM activity and those that do not. When EM is not restricted, the precision and quality of public information provided to an investor decreases, causing an increase in the investor's level of uncertainty [60].

5.3. Examination of endogeneity

The potential for endogeneity biases to occur in the application of EM is acknowledged due to the discretion of management. Companies facing losses or attempting to avoid losses may engage in EM to mitigate negative market repercussions. These actions can significantly impact a firm's reported financial performance. To address the possibility of a simultaneous determination of EM and *CmpreScore*, B.C. Sohn's (2016) [54] method of including a one-period lag of the comparison score (denoted as *L.CmpreScore*)⁵ was employed in the re-examination of Eq. 1. This approach aims to alleviate causality concerns and exogenise the variable, as proposed in [61]. Results of this analysis can be found in Table 7.

In support of previous findings, the comparability score is statistically significant and remains negative using Method 1. Results weakly support past results' validity in that increasing comparability is inversely associated with AEM and exogenous from management behaviour. Leverage continues to show a positive association with AEM. In contrast, *BigN* and *Analysts* exhibit a negative association suggesting that firms with greater leverage

⁵Replacing *xt* with *xt-1*.

have a greater reason to obscure earnings. Firms audited by BigN audit firms and those with increased analysts following show constraints in the attempt to conceal reported earnings, thereby decreasing asymmetric information.

An examination of control variable coefficients reveals that size was not a factor in the level of EM activity, as proxied by *B/M*. The results of the resource allocations measured by *ROA* and *ROA* indicate that more efficient firms employ less EM. Countries with weaker investor protection tend to hold more liquid assets to conceal EM from discretionary fund use when examining cash flow. The positive coefficients for *CFO/A* and *CFO/A* in this study of frontier markets lead to a similar conclusion. The findings are consistent with previous research [62] that suggests firms with losses are likely to engage in EM to avoid reporting losses. The association between EM and stock return as measured by *Return* is positive, indicating that increased EM in the current period may polish earnings and be reflected in increased stock returns.

Endogeneity checks suggest an exogenous relationship between financial statement comparability and management within a firm. Further examination is conducted to investigate the influence of information asymmetry on corporate and individual decision-making,

with a focus on instances where a firm has reported diminished earnings or losses and adopted IFRS. The impact of the country's legal system on AEM is also considered.

5.4. Decreased earnings and losses

The POT provides a theoretical framework in which managers are incentivised to manage earnings downward to avoid dividend payouts and retain earnings. Previous research by A.W. Bartik, et al. (2020) [63] also suggests that management actively manages earnings to avoid losses, as evidenced by the volume of firms with an unusually low frequency of small earnings decreases and small losses. This regularity increases as reported earnings remain positive. The intuition here suggests that the signalling of non-negative earnings information outweighs the effects of information asymmetry. A review of decreased earnings and slight increases was conducted, with firms with small profits defined as net income (scaled by lagged total assets) between 0 and 0.01 and small earnings increases defined as annual net income changes in the interval >0 and <0.01, following the definitions of K.A. Gunny (2010) [64]. The results of this review, as reported in Panel A of Table 8, indicate that both firms with small profits and small earnings increases show a positive association between AEM and greater comparability. The motivation

Table 8. Supplementary tests.

Panel A framework					Panel B			Panel B Earnings			IFRS Adoption	
Variable	Small Profit	Std Err	Small Increase	Std Err	2005-2006	Std Err	2007- 2009	Std Err	Civil	Std Err	Common	Std Err
CmpreScore	0.054*	2.06	0.043*	2.30	0.001	-0.41	-0.002*	-2.45	-0.001	-1.45	-0.200*	-2.45
Leverage	0.025	1.06	0.098***	3.340	-0.196**	2.94	0.018*	2.16	0.018*	2.16	0.018*	2.16
Big4	-0.295***	0.11	-0.152***	-0.07	-0.655***	-0.19	-0.275***	-0.04	-0.847*	-0.49	-0.475*	-0.09
Analyst	-0.001***	-5.05	-0.017**	-3.13	0.000	-0.01	-0.006**	-2.62	-0.006**	-2.62	-0.006**	-2.62
B/M	0.001	1.67	-0.001	-1.73	-0.001	-1.21	0.001**	2.91	0.001**	2.91	0.001**	2.91
ROA	1.073	1.240	0.522	1.750	-0.146	1.60	-0.222***	13.05	-0.222***	13.05	-0.222***	13.05
ROA	0.000		-0.037		0.505***		0.257***		0.257***		0.257***	
CFO/A	-0.077	0.00	-0.243***	-0.13	-0.131**	5.43	0.055***	15.00	0.055***	15.00	0.055***	15.00
CFO/A	0.854***	2.60	0.623***	-9.50	0.357***	-2.70	0.82***	-8.29	0.082***	-8.29	0.82***	-8.29
CFO/A Loss Return	0.004	21.90	0.012	19.90	0.002	5.38	-0.021 *** 0.200*	1.66	-0.021*** -0.20*	11.66	0.021***	11.66
Intercept	-0.002	0.12	0.000	0.66	0.004	0.07	-18.989	-4.46	-18.989	-4.46	0.002*	-4.46
Year Dummies Industry	24.728	-0.87	-46.596	-0.15	13.768	-0.73	yes	-2.30	yes	-2.30	-18.989	-2.30
Dummie	yes	1.18	yes	1.90	yes	0.66	yes	18.0	yes	1.52	yes	-1.52
Obs	1333		1785		1029		2506		9214		2862	
Adj R sq	0.323		0.073		0.994		0.623		0.384		0.454	

The Table presents the results of a fixed-effects panel data regression analysis, with standard errors corrected for firm-level clustering. The coefficients of the independent variables are reported in the first line, with the corresponding standard errors presented in parentheses. Significance levels are identified at three levels: 0.05 *, 0.01 **, and 0.001 ***. Each column of the table displays the results for a different dependent variable, as specified at the top of the respective columns.

to manage earnings is stronger in these cases as it may help the firm evade external monitoring. The increased EM would also imply that the accounting data is less informative despite increased comparability. Additionally, results reveal that a BigN auditor or firms with a greater number of analysts following are less likely to engage in EM, thereby increasing the integrity of the data.

5.5. European adoption of IFRS

In 2005, the European Union (EU) implemented IFRS, fundamentally altering the EU's economic landscape by enhancing global market integration and reducing information asymmetry [65]. This study investigates the impact of IFRS adoption on financial comparability by examining data from 2005-2006 (pre-EU IFRS adoption) and 2007-2009 (post-adoption), focusing on changes in AEM (see Table 8, Panel B). Additionally, the study differentiates between IFRS and non-IFRS-adhering countries for 2007-2009. The results reveal that IFRS adoption significantly reduced AEM in IFRS-adhering countries, as evidenced by a shift in the *CmpreScore* coefficient from positive to negative (-0.005 at $p < 0.001$). This indicates that IFRS adoption enhances financial comparability and restricts AEM, thus mitigating information asymmetry globally. It also aligns with the interest convergence theory, which states that reform is brought about by aligned interests.

5.6. Civil versus common law legal systems

Emerging evidence suggests that market integrity, culture, and institutional context, including a country's legal system, significantly influence EM [66]. Studies indicate that common law countries provide better investor protection and quicker recognition of bad news, leading to stricter financial disclosure and enforcement [61]. To assess the impact of legal systems on EM and financial comparability, Eq. 4 is re-evaluated using a binary variable for common and civil law countries. Panel C of Table 8 reveals an inverse relationship between AEM and *CmpreScore* in both legal systems, but statistical significance is only observed in common law countries (α of 0.05), affirming their stronger investor protection mechanisms.

6. Conclusions

This analysis examines the impact of financial reporting comparability on information asymmetry. Firstly, it was demonstrated that the constraint of EM increases with increased financial comparability, the presence of BigN

auditors, and an increased number of analysts following the firm. Secondly, it was found that contrary to expectations, restrictions of debt payments due to leverage did not impede management from opportunistic EM behaviour. Thirdly, the use of BigN auditors and the greater number of analysts following a firm were negatively associated with discretionary accruals. The results of this research have narrowed gaps in comparability literature and highlighted that information asymmetry could be reduced through increased financial reporting comparability in the 19 frontier market countries. Theoretical underpinnings and practical implications resulting from this research follow.

6.1. Theoretical implications

The theoretical contributions of this study are threefold. First, the findings challenge the POT by revealing that higher leverage in firms exacerbates information asymmetry and reduces the quality of investor information, thereby increasing EM. Second, the study lends credence to the KBV theory, as evidenced by the global reduction in EM following the adoption of IFRS and enhanced oversight by BigN audit firms and analyst coverage. Lastly, the results support the convergence theory, indicating that the harmonization of accounting standards reduces principal-agent conflicts. This is further corroborated by the correlation between increased financial comparability and a growing number of analysts following a firm, suggesting that standardization leads to more accurate financial data interpretation. Consequently, the study's results support the objectives mentioned in the Introduction regarding the relationship between financial comparability and governance mechanisms.

6.2. Practical implications

The practical implications of this study can be divided into four aspects. *Firstly*, improved comparability provides valuable information for regulators in emerging markets and similar institutional contexts. In situations with a high degree of information asymmetry, greater comparability—such as audits and forms of monitoring—can equip external stakeholders with the necessary information to monitor managers' actions. Adopting and expediting a common accounting reporting standard is a crucial step toward achieving this goal. *Secondly*, corporate governance, reinforced by legal frameworks like those provided by common law legal systems, standard boards, and professional associations, and their effective enforcement,

can positively impact EM practices and reduce information asymmetry. This allows investors to better understand the quantity and quality of disclosures within a country's legal framework. *Thirdly*, although asymmetric information is detrimental, large firms did not exhibit a greater tendency to manage earnings compared to smaller firms, contrary to the pattern observed in loss-reporting firms. This finding underscores that corporate governance initiatives should be uniformly applied across firms of all sizes and earnings levels. *Fourthly*, firms in emerging markets have distinct operating characteristics, and the variation in behaviour from mature markets suggests that different values and standards exist. Therefore, conclusions drawn from other markets cannot be universally applied.

APPENDICES

Appendix A

According to W. Martens, et al. (2020) [51], the process of calculating comparability involves the following stages:

Stage 1: In the first stage of the comparability calculation process, as outlined in Equation 1, a correlation between economic results and income is established for each country-industry year using all the data available for a company. It is important to note that a minimum of ten firms must be included in each country-industry-year in order for the estimate to be valid.

$$R_{it}^{Cj} = \gamma_0^{Cj} + \gamma_1^{Cj} \left[\frac{NI_{it}}{P_{it-1}} \right] + \gamma_2^{Cj} \left[\frac{\Delta NI_{it}}{P_{it-1}} \right] + \gamma_3^{Cj} L_{it} + \gamma_4^{Cj} L_{it} \left[\frac{NI_{it}}{P_{it-1}} \right] + \gamma_5^{Cj} L_{it} \left[\frac{\Delta NI_{it}}{P_{it-1}} \right] + \varepsilon_{it} \quad (1)$$

where the symbol Cj denotes the price multiples associated with the accounting system for country C in industry j . Thus, each γ coefficient varies among the sample's countries, industries, and years. The variable Δ serves as the change agent, NI represents earnings per share before unusual items, while letters i and t denote the firm and year, respectively, ε is the error term. The term P refers to share price, and R represents the buy-and-hold return on investment. Additionally, L is a dummy variable assigned a value of one if NI is below zero, and zero otherwise. It is important to note that all data used in this study was collected in US dollars.

Stage 2: As outlined in Equation 2, the second stage of the comparability calculation process involves estimating a company's fitted stock return utilizing the country model.

$$\hat{R}_{it}^{Cj,Cj} = \gamma_0^{Cj} + \gamma_1^{Cj} \left[\frac{NI_{it}}{P_{it-1}} \right] + \gamma_2^{Cj} \left[\frac{\Delta NI_{it}}{P_{it-1}} \right] + \gamma_3^{Cj} L_{it} + \gamma_4^{Cj} L_{it} \left[\frac{NI_{it}}{P_{it-1}} \right] + \gamma_5^{Cj} L_{it} \left[\frac{\Delta NI_{it}}{P_{it-1}} \right] + \varepsilon_{it} \quad (2)$$

Stage 3: As detailed in Equation 3, the third stage of the comparability calculation process involves estimating the fitted stock return under each counter-sample model for each company, as at least two nations with sufficient firms in each industry-year are required. Specifically, this step involves estimating the fitted stock return for each company under each counter-sample model for each industry-year.

$$\hat{R}_{it}^{Cj,Cj^n} = \gamma_0^{Cj^n} + \gamma_1^{Cj^n} \left[\frac{NI_{it}}{P_{it-1}} \right] + \gamma_2^{Cj^n} \left[\frac{\Delta NI_{it}}{P_{it-1}} \right] + \gamma_3^{Cj^n} L_{it} + \gamma_4^{Cj^n} L_{it} \left[\frac{NI_{it}}{P_{it-1}} \right] + \gamma_5^{Cj^n} L_{it} \left[\frac{\Delta NI_{it}}{P_{it-1}} \right] + \varepsilon_{it} \quad (3)$$

Stage 4: In the fourth stage of the comparability calculation process, as outlined in Equation 4, the absolute value of the difference between the within-sample and counter-sample fitted stock prices for each company is calculated and represented as *DIFF*. This step is intended to quantify the variation in the estimated stock return between the within-sample and counter-sample models for each company.

$$DIFFERENCE_{i,t}^{Cj,Cj^n} = \left| \hat{R}_{i,t}^{Cj,Cj} - \hat{R}_{i,t}^{Cj,Cj^n} \right| \quad (4)$$

Stage 5: As detailed in Equation 5, the fifth stage of the comparability calculation process involves calculating the median absolute difference between the fitted stock prices of the within-sample and counter-samples, multiplied by the negative natural logarithm. This computed value serves as an indicator of the firm's assessment of comparability with the counter-sample, with larger values indicating a higher degree of comparability. This step is intended to provide a comprehensive measure of the overall comparability of the results between the within-sample and counter-sample models.

$$CmpreScore_{it} = -\ln[\text{Median}(DIFFERENCE_{i,t}^{Cj,Cj^n})] \quad (5)$$

It is important to note that while companies i and k may originate from different countries, they may share the same two-digit Standard Industrial Classification (SIC) industry code. To explain for accounting comparability between firms across national boundaries, the variable *CmpreScore* is estimated utilizing time-series regression. This approach enables capturing the accounting comparability between firms, despite the differences in their national origins.

Appendix B

The study C. Leuz, et al. (2003) [53] employs four metrics for EM: EM1 and EM2, which focus on income smoothing, and EM3 and EM4, which are discretionary income measures. Notably, the “small-loss avoidance” observed in EM4 allows for both AEM and Real EM strategies, diverging from the exclusive use of AEM. This study adopts the first three metrics, aligning with prior research such as [67].

To commence the analysis, accruals are initially calculated utilizing the equation represented in Equation 6.

$$\text{Accruals}_{it} = (\Delta CA_{it} - \Delta \text{Cash}_{it}) - (\Delta CL_{it} - \Delta STD_{it} - \Delta TP_{it}) - \text{Dep}_{it} \quad (6)$$

where CA_{it} represents the overall total of current assets, Cash_{it} represents cash and cash equivalents, CL_{it} represents the total of current liabilities, STD_{it} represents short-term debt, TP_{it} represents taxes payable, and Dep_{it} denotes depreciation and amortization expenses. The three measures of AEM are denoted as Equation 8 to Equation 10.

$$EM1 = \sigma(\text{Operating Earnings}) / \sigma(\text{Cash flow from operations}) \quad (7)$$

The measure of EM ($EM1$) is determined by dividing the standard deviation of operating earnings net of interest and taxes by the standard deviation of net operating cash flows. The smaller the value of this metric, the greater the likelihood that management is utilizing accruals to mitigate the variance of operating cash flows.

$$EM2 = \rho(\Delta \text{Accruals}, \Delta \text{Cash flow from operations}) \quad (8)$$

The measure of EM ($EM2$) is calculated as the correlation between changes in accruals and changes in net operating cash flow. Notably, net cash flow from operations is obtained by subtracting accruals from operating earnings.

$$EM3 = |\text{Accruals}| / |\text{Cash flow from operations}| \quad (9)$$

The measure of EM ($EM3$) is computed by dividing the absolute values of accruals by the absolute value of operational cash flow.

The firm-level EM index in this study is formulated based on methodologies from C. Leuz, et al. (2003) [53] and C.H. Sheu, et al. (2007) [68], incorporating three individual measures: EM1, EM2, and EM3. These measures are ranked, and to maintain consistency, particularly for EM3, the rankings for EM1 and EM2 are inverted as per Equation 10. A composite firm-level EM score is then calculated by averaging the scaled rankings of these three measures for each firm (i), with higher scores indicating a greater propensity for EM.

$$EM_{it} = \frac{(\text{Rank}(EM1_{it})^{-1} + \text{Rank}(EM2_{it})^{-1} + \text{Rank}(EM3_{it}))}{3} \quad (10)$$

CRediT author statement

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COMPETING INTERESTS

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

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A model of entrepreneurial intention of graduates in the Mekong river delta

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Abstract:

This article aims to investigate the determinants of the inclination of Mekong river delta (MRD) graduates towards entrepreneurship, with the purpose of providing viable solutions to authorities to enhance the efficacy of entrepreneurial endeavours. The analysis relied on primary data derived from a survey conducted in 2021, which involved 341 graduates from six provinces within the MRD. Various statistical techniques were employed to analyse the data, including the Cronbach's Alpha test, exploratory factor analysis (EFA), and linear regression analysis. The findings reveal that the entrepreneurial intention of these graduates is positively influenced by a multitude of factors, such as behaviour control, subjective norms, attitude towards entrepreneurship, and perceived desirability, while being negatively impacted by the propensity to act. The study's primary contribution is the provision of an updated and cohesive framework that enhances understanding of the entrepreneurial intention among graduates in the MRD. The author offers actionable recommendations for various stakeholders: policymakers, universities, entrepreneurs, and researchers.

Keywords: attitude toward entrepreneurship, behaviour control, entrepreneurial intention, perceived desirability, propensity to act, subjective norms.

Classification number: 2.2

1. Problem statement

Entrepreneurship has emerged as a prominent avenue to address a wide range of societal, environmental, and economic challenges. Consequently, comprehending the intricacies of entrepreneurship and entrepreneurial intention holds significant value for scholars and policymakers in evaluating and fostering entrepreneurial activities within specific regions. The Vietnamese government's approval of 2016 as the year of entrepreneurship has led to notable changes in economic and social development in the MRD. The development of several business incubators, such as Can Tho University's Business Incubators (2012), Soc Trang Business Incubators (2014), Vietnam-Korea Business Incubator (2015), and Tra Vinh Business Incubators (2018), signifies a rapidly growing entrepreneurial ecosystem in the region. Nevertheless, entrepreneurship rates of the MRD have been observed to be comparatively lower than in other parts of the

country. Moreover, the MRD faces a dearth of country-specific studies that concentrate on entrepreneurs and their associated dynamics. Furthermore, the year 2020 witnessed an exceptionally challenging period for the MRD region. Adverse impacts from drought and saline intrusion have had detrimental effects on the region's economy, daily livelihoods, agricultural production (particularly fisheries and fruit cultivation), and the quality of agricultural soil. Alarming reports indicate that saline intrusion in the MRD has reached severe levels, resulting in damage to approximately 39,000 hectares of rice production areas. Compounding these challenges, the COVID-19 pandemic has had a profound and unprecedented impact. In response to these circumstances, economists have proposed self-employment as one of the most effective alternatives. Self-employment, or entrepreneurship, has the potential to generate substantial economic output, and the MRD region is no exception. Recognizing

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the vital role of entrepreneurship in the social and economic development of the MRD, this analysis explores a model of entrepreneurial intention among MRD graduates. The findings can provide pertinent solutions for authorities to enhance the effectiveness of entrepreneurship within the MRD region.

2. Literature review and theory development

2.1. Entrepreneurial intention

Over the past few decades, the concept of entrepreneurial intention (EI) has garnered considerable attention from scholars and educators. Previous researchers have proposed various definitions of EI with the aim of comprehending its underlying nature. For instance, employing primarily cognitive theory, B. Bird (1988) [1] characterised intentionality as a mental state that directs attention, experience, and action towards a specific target in order to achieve a particular objective. This construct serves as a crucial determinant in comprehending the entrepreneurial process. Entrepreneurial intention represents the initial step in the identification, creation, and exploitation of opportunities [2]. The intention to become an entrepreneur is directly linked to effective performance in this realm. Intention serves as a precursor in explaining behaviour and signifies an individual's dedication to engaging in entrepreneurial activities [3]. In the investigation of the entrepreneurial process, J. Ao, et al. (2014) [4] recognised entrepreneurial intention as a crucial element that aids in comprehending the initiation of a new business. This process encompasses a series of activities undertaken by individuals, including opportunity exploration, business plan creation, resource and relationship utilisation, as well as consideration of the conducive environment for commencing a business venture.

2.2. The factors influencing on individual's entrepreneurial intentions

Researchers have used various approaches to measure factors that impact an individual's entrepreneurial intentions. Notably, two prominent models commonly applied in Vietnam and globally include the Entrepreneurial Event Model proposed by A. Shapero, et al. (1982) [5], and the Theory of Planned Behaviour developed by I. Ajzen (1991) [6]. These models have gained recognition for their effectiveness in capturing the multidimensional aspects of entrepreneurial intentions. In addition to these established models, other scholars have

proposed alternative frameworks to further enhance our understanding of entrepreneurial intentions. For instance, P. Davidsson (1995) [7], N.F. Krueger, et al. (1994) [8] have introduced new conceptual models that offer unique perspectives on the factors influencing entrepreneurial intentions. These additional models contribute to the growing body of research in this field and provide valuable insights into the complex dynamics involved in entrepreneurial decision-making processes.

2.2.1. Perceived behavioural control

Perceived behavioural control is related to an individual's perception of the ease or difficulty of performing a particular behaviour. In the context of entrepreneurship, perceived behavioural control relates to an individual's perception of their ability to start and manage a business successfully. Perceived behavioural control describes the individual's awareness of how difficult it is to become an entrepreneur [9]. It refers to an individual's belief in their capability to perform a specific task or behaviour successfully. If a person perceives that he can control over critical aspects of starting and managing a business, such as developing a business plan, securing funding, and managing resources effectively, he is more likely to feel confident to start a business and pursue entrepreneurship as a career. This, in turn, increases the strength of his intention to become an entrepreneur. Therefore, successfully perceived behavioural control plays a crucial role in shaping an individual's intention to start and manage a business. A high level of perceived behavioural control may increase the strength of an individual's intention. Therefore, the first hypothesis is proposed:

Hypothesis H₁: Perceived behaviour control is positively related to entrepreneurial intention.

2.2.2. Subjective norms

Subjective norms encompass the social obligations and influences that students encounter when expressing their intentions to establish entrepreneurial ventures. This pertains to the extent of agreement or disagreement exhibited by parents, relatives, mentors, and friends regarding the student's decision to embark on an entrepreneurial path. Subjective norms are rooted in an individual's perception of the social pressure to engage or refrain from a specific behaviour, which is shaped by the attitudes and beliefs of their significant others. While subjective norms have demonstrated inconsistent predictive power in

prior studies concerning entrepreneurial intention [10], it is imperative to investigate their relevance within the Vietnamese context. In Vietnam, social norms and cultural values wield considerable influence over individual behaviours. For instance, if parents, relatives, mentors, and friends possess positive attitudes and beliefs regarding entrepreneurship, it can heighten the perceived social pressure to initiate a business venture and bolster the individual's intention to become an entrepreneur. Conversely, if these significant harbour negative attitudes and beliefs about entrepreneurship, it can engender a perceived social barrier, diminish the individual's intention to commence a business, and even lead to the abandonment of entrepreneurial aspirations. Consequently, social norms are expected to exert an impact on entrepreneurial intention, as posited by the following hypothesis:

Hypothesis H₂: Subjective norms are positively related to entrepreneurial intention.

2.2.3. Attitude towards the behaviour

Attitude towards the behaviour is related to the perception of a behaviour's outcome and how an individual evaluates it positively or negatively about being an entrepreneur. Attitude towards the behaviour was defined as how favourable or unfavourable an individual evaluates or appraises the behaviour in question [11]. Accordingly, if an individual holds a higher rate of attitude towards the behaviour, he will be more likely to attempt to become an entrepreneur. Conversely, if someone has a negative attitude towards entrepreneurship, he may see it as risky, difficult, or unattractive, and be less likely to consider it as a career option. This aspect is in line with L. Kolvereid (1996) [12], who assumed that students who have a higher attitude towards the behaviour, subjective norm, and perceived behavioural control are more likely to form entrepreneurial intentions. This means that if they perceive entrepreneurship as an attractive and feasible career option and feel that their social environment supports and encourages it, they are more likely to intend to become entrepreneurs. Therefore, educational and other educational institutions can play a crucial role in promoting entrepreneurship by fostering a positive attitude towards it, creating a supportive social environment, and providing resources and training to enhance students' perceived behavioural control. With a higher level of attitude towards the behaviours, an individual will be more likely to form entrepreneurial intentions. Therefore, the first hypothesis is developed as follows:

Hypothesis H₃: Attitude towards the behaviour is positively related to entrepreneurial intention.

2.2.4. Self-efficacy

According to S. Cromie (2000) [13], self-efficacy refers to an individual's trust in their capability. That is, whether or not his or her goals can be obtained. F. Pajares (2002) [14] also agrees that if people have little belief that what they do will get desirable outcomes, they will have insufficient motivation to face adversities. Additionally, G. Segal, et al. (2005) [15] argued that higher entrepreneurial self-efficacy leads to a higher intention to involve in entrepreneurial actions. Although perceived behavioural control is intimately concerned with self-efficacy concepts [11], N.G. Boyd, et al. (1994) [16] believed that self-efficacy is a successful framework to explain the evaluation and choice process related to entrepreneurial intention and behaviour development. This analysis proposes the following hypothesis:

Hypothesis H₄: Self-efficacy is positively related to entrepreneurial intention.

2.2.5. Perceived desirability

E.J. Gatewood, et al. (1995) [17] pointed out that entrepreneurial intention encompasses not only attitudes but also *perceived desirability* and feasibility. Perceived desirability pertains to an individual's personal inclination and interest in initiating a business venture. Consequently, it serves as a motivational factor that facilitates the translation of positive attitudes into entrepreneurial intention. Specifically, possessing a positive attitude towards entrepreneurship stimulates an individual's aspiration to establish a business and engenders behaviours aligned with the intention of becoming an entrepreneur [5]. Based on these premises, the following hypothesis is formulated:

Hypothesis H₅: Perceived desirability is positively related to entrepreneurial intention.

2.2.6. Perceived feasibility

Perceived feasibility refers to an individual's subjective assessment of their capability to enact their intended behaviour, specifically in the context of entrepreneurial pursuits. It is closely intertwined with the presence of influential individuals within the immediate environment who play a crucial role in bolstering the individual's sense of feasibility in establishing their own business. Notably, the perception of feasibility has demonstrated its capacity to predict behaviour, particularly are situations where control over the

outcomes are inherently ambiguous [18]. F. Linan (2004) [3] discovered that a substantial portion of the variation in intention can be attributed to the interplay between attitude towards entrepreneurship and perceived feasibility. Moreover, perceived feasibility and desirability are intricately linked to decision-making processes surrounding careers and entrepreneurial endeavours. Hence, the subsequent hypothesis is formulated as follows:

Hypothesis H_6 : Perceived feasibility is positively related to entrepreneurial intention.

2.2.7. A propensity to act

The propensity to act represents a persistent inclination or disposition towards taking action, which can be actualised based on perceptions of control. It signifies a desire to attain control through active engagement. Despite the inherent stability of the propensity to act construct, there exists a belief that individuals can be trained to exhibit greater autonomy by acquiring self-management skills or skills aligned with overcoming adversity. In relation to the propensity to act, A. Shapero, et al. (1982) [5] equated it with an internal locus of control, implying that the measurement of locus of control can serve as a means to predict the influence of propensity to act on entrepreneurial intention. Thus, the fifth hypothesis in this study pertains to the relationship between these factors:

Hypothesis H_7 : Propensity to act is positively related to entrepreneurial intention.

2.3. Research model (Fig. 1)

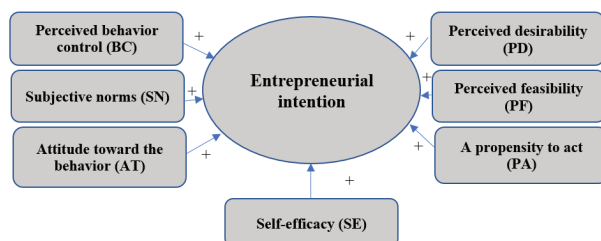


Fig. 1. Flow chart of the research model.

3. Research methodology

The data collection methodology employed in this study involved non-random purposive sampling. The survey targeted graduates residing in six provinces within the MRD: An Giang, Can Tho, Soc Trang, Tra Vinh, Dong Thap, and Ben Tre. The researchers identified potential respondents primarily through two channels: (1) personal connections and relationships, and (2) participation in start-up groups on social networks. The construction of the questionnaire drew

upon a comprehensive review of relevant literature and insights gathered from four exploratory interviews conducted with an entrepreneurship lecturer, a manager of an entrepreneurship centre, and two graduates. Additionally, the questionnaire underwent a pre-testing phase involving nine students from An Giang University, and minor revisions were made to ensure its clarity and comprehensibility. The Likert-5 scale of measurement was employed within the questionnaires to capture participants' responses. The hypothesis was tested using the SPSS version 20.0, as guided by H. Trong, et al. (2008) [19].

4. Results

4.1. Sample description

A total of 347 questionnaires were initially collected by the author. Following the data cleaning process, 341 questionnaires were deemed satisfactory and suitable for analysis. Therefore, the official sample size for the subsequent analysis included 341 observations. Details pertaining to the survey sample are presented in Table 1.

Table 1. Sample statistics by province/city.

Province	Frequency	Percentage
An Giang	133	39
Can Tho	130	38.1
Ben Tre	7	2.1
Soc Trang	66	19.4
Dong Thap	4	1.2
Tra Vinh	1	0.3
Total	341	100.0

Source: Authors' surveys (2020).

Gender: Table 2 shows that of the 341 respondents, there were 160 females, equivalent to 46.9%. The remaining 181 respondents were male, equal to 53.1%. There is not much difference in gender in the sample.

Table 2. Sample statistics by gender.

Gender	Frequency	Percentage
Male	181	53.1
Female	160	46.9
Total	341	100.0

Source: Authors' surveys (2020).

Entrepreneurial intention: The proportion of people with the intention to start up after being employed is highest (39%) (Table 3). Next, 38% of the

respondents have the intention to open their own business after graduation. Few graduates have the intention at a young age (1.2%).

Table 3. Sample statistics by entrepreneurial intention.

Period of time	Frequency	Percentage
After being employed	133	39
After graduation	130	38.1
At university	67	19.6
At high school	7	2.1
At young age	4	1.2
Total	341	100.0

Source: Authors' surveys (2020).

Business industry: Table 4 points out that most of the graduates start-up in the field of service (31%). Next, manufacturing accounts for a large proportion (30.8%). Retailing is also chosen by 19.9% of respondents. Distribution and medical are not really attractive (3.4 and 3.8%).

Table 4. Sample statistics of business industries.

Industry	Frequency	Percentage
Service	106	31
IT	38	11.3
Manufacturing	105	30.8
Retailing	68	19.9
Distribution	11	3.4
Medical	13	3.8
Total	341	100.0

Source: Authors' surveys (2020).

Entrepreneurial courses: In general, graduates used to take entrepreneurial courses in which Accounting and International Business are the two most popular courses. Only 99 respondents took the business strategy course (Fig. 2).

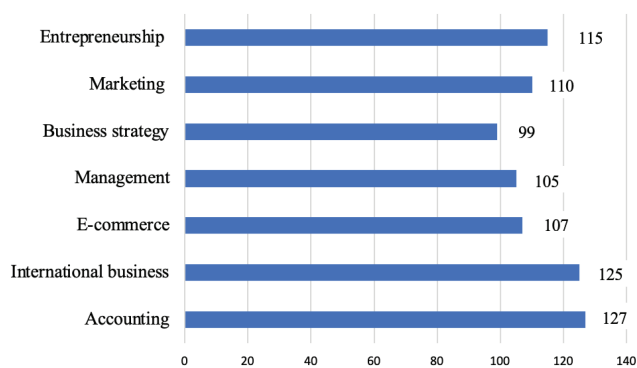


Fig. 2. Entrepreneurial courses taken by graduates. Source: Authors' surveys (2020).

4.2. Scale evaluation with Cronbach's alpha confidence coefficients

Cronbach's alpha coefficient assesses scale reliability. Cronbach's alpha test results for independent factors (Tables 5, 6) show that the scale components of behavioural control, subjective norms, attitude, self-efficacy, desirability, feasibility, and propensity to act have Cronbach's alpha coefficients all meet the requirements of greater than 0.6; total variable correlation coefficients of the observed variables are more significant than 0.3; if each observed variable is deleted, the Cronbach's alpha value of the scale will be smaller. Only the component Feasibility gets a higher

Table 5. Cronbach's alpha of the independent variable.

Items	Scale means if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Behavior Control; Cronbach's alpha =0.726				
BC1	12.34	3.137	0.595	0.616
BC2	12.35	3.288	0.522	0.661
BC3	12.38	3.389	0.511	0.668
BC4	12.47	3.556	0.436	0.710
Subjective norms; Cronbach's alpha =0.771				
SN1	12.33	3.358	0.514	0.747
SN2	12.31	3.245	0.620	0.694
SN3	12.33	3.109	0.613	0.695
SN4	12.28	3.256	0.550	0.729
Attitude; Cronbach's alpha =0.872				
AT1	16.37	5.881	0.746	0.834
AT2	16.32	5.683	0.762	0.829
AT3	16.20	6.238	0.613	0.865
AT4	16.35	5.918	0.667	0.853
AT5	16.32	5.760	0.710	0.842
Self-efficacy; Cronbach's alpha =0.807				
SE1	7.81	2.149	0.659	0.734
SE2	7.99	2.047	0.650	0.743
SE3	8.03	2.049	0.659	0.733
Perceived desirability; Cronbach's alpha =0.863				
PD1	7.67	2.963	0.709	0.839
PD2	7.82	2.345	0.775	0.782
PD3	7.59	2.772	0.753	0.798
Perceived feasibility; Cronbach's alpha =0.880				
PF1	7.56	2.123	0.873	0.738
PF2	7.62	2.100	0.711	0.893
PF3	7.49	2.421	0.740	0.857
Propensity to act; Cronbach's alpha =0.876				
PA1	4.19	2.596	0.767	0.820
PA2	4.09	2.456	0.714	0.873
PA3	4.21	2.542	0.810	0.783

Source: Analysis results from SPSS.

Cronbach's alpha value if the variable is deleted, but the author still maintains the ingredients to include in factor analysis, avoiding deleting suitable variables.

Table 6. Cronbach's alpha of the dependent variable.

Items	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
<i>Entrepreneurial intention; Cronbach's alpha =0.777</i>				
EI1	20.74	7.612	0.551	0.736
EI2	20.82	7.728	0.541	0.739
EI3	20.83	7.500	0.558	0.734
EI4	20.74	7.574	0.583	0.728
EI5	20.69	8.098	0.458	0.759
EI6	20.70	8.135	0.446	0.762

Source: Analysis results from SPSS.

Cronbach's alpha testing results for the scale Entrepreneurial intention show that Cronbach's alpha coefficients are all satisfactory, greater than 0.6, the total variable correlation coefficients of the observed variables are greater than 0.3, and the value of Cronbach's alpha if an item is deleted is smaller than Cronbach's alpha's value of the scale. Therefore, the scales of the above factors meet the requirements to include EFA in the factor analysis.

4.3. Exploratory factor analysis (EFA)

The scale of factors, including 7 independent variables and 1 dependent variable with 31 observed variables, met the requirements of Cronbach's alpha test and were included in the EFA.

The process of analysing the exploratory must meet the following conditions: (1) the factor loading is greater than 0.5, proving that these observed variables have reliability; (2) KMO coefficient satisfies factor analysis if $0.5 \leq KMO \leq 1$ [20]; (3) Sig coefficient =0.000 of Bartlett's Test shows that there are statistically significant correlated observed variables in the population, so these observations are suitable for factor analysis; (4) Cumulative variance greater than 50% [21] is suitable for factor analysis.

4.3.1. Exploratory factor analysis of independent variables

Table 7 shows that the EFA testing results of the independent variables receive KMO and Bartlett's test results that KMO value =0.795>0.05 and the coefficient Sig.=0.000<0.05. Therefore, it is concluded that the observed variables in the analysis have correlation, and EFA is appropriate in this study. Factor analysis results also show that the

total variance explained is 70.229%>50%, and the stop when extracted at factor 7 is 1.431>1; all meet the conditions. Seven factors are drawn from the analysis.

Table 7. Results of rotation matrix of factor components.

	Components						
	1	2	3	4	5	6	7
AT2	0.848						
AT1	0.820						
AT4	0.794						
AT5	0.792						
AT3	0.734						
PA3		0.880					
PA1		0.848					
PA2		0.838					
SN3			0.807				
SN2			0.791				
SN4			0.710				
SN1			0.679				
PD2				0.883			
PD3				0.878			
PD1				0.846			
PF1					0.885		
PF3					0.838		
PF2					0.818		
BC1						0.779	
BC2						0.736	
BC3						0.686	
BC4						0.666	
SE1							0.834
SE3							0.822
SE2							0.809
KMO				0.795			
Sig. Bartlett				0.000			
Eigenvalue				1.431			
Total Variance explained				70.229			

Source: Analysis results from SPSS.

Results of the rotation matrix of the EFA analysis show that 7 new groups of factors with observed variables have factor loading coefficients all greater than 0.5.

4.3.2. Exploratory factor analysis of dependent variables

The results of the exploratory factor analysis of the dependent variables receive KMO and Bartlett's test results that show KMO value = 0.791 > 0.5 and the coefficient Sig. = 0.000 < 0.05, then it is concluded that the observed variables included in the analysis have a correlation with each other and the EFA is appropriate to use in this study. Factor analysis results also show that the total variance explained is 47.405% > 40%, and the stop when extracted at factor 1 is 2.844 > 1, all meet the conditions meet (Tables 8, 9). There are no factors drawn from the analysis, and they are still named entrepreneurial intention (EI). There is no change in the factors of the proposed model.

Table 8. Summary of coefficient statistics results in EFA analysis for the dependent variable.

IT	Criteria	Values	Conditions	Results
1	KMO	0.791	≥0.5	Satisfied
2	Sig Bartlett's Test	0.000	≤0.05	Satisfied
3	Eigenvalues	2.844	>1	Satisfied
4	Total variance explained	47.405%	≥40%	Satisfied

Source: Analysis results from SPSS.

Table 9. Results of rotation matrix of factor components.

Items	Components
EI4	0.744
EI3	0.728
EI2	0.713
EI1	0.713
EI5	0.616
EI6	0.605

Source: Analysis results from SPSS.

4.4. Regression analysis

Multiple linear regression was performed with the Enter method to estimate the theoretical model. Multiple linear regression results show that the model has a coefficient R^2 of 0.266 and an adjusted R^2 of 0.251. That means that 25.1% of the variation in the dependent variable is explained by the independent variables in the model, and the rest is explained by the independent variables outside. The result of the F-value test with Sig value.=0.000 < 0.05 from the ANOVA analysis table (Table 10) shows that the built multiple linear regression model is suitable for the data set, and it is appropriate to use.

Table 10. ANOVA results for regression.

Model	Sum of squares	df	Mean square	F-value	Sig. coefficient
Regression	26.920	7	3.846	17.236	.000 ^b
Residual	74.297	333	0.223		
Total	101.217	340			
Independent variables: BC,PF,SE,PD,AT,SN,PA					
Dependent variables: EI					

Source: Analysis results from SPSS.

The results of the multiple regression coefficient show the value of Sig. coefficients of all variables are available. <0.05, so hypotheses H1, H2, H3, H5, H7 are accepted (Table 11).

Table 11. Regression results.

Model B	Unstandardized coefficient	Standardized coefficient		t	Sig. Tolerance	Collinearity statistics	
	Std. Error	Beta				VIF	
(Constant)	1.651	0.359		4.598	0.000		
BC	0.163	0.049	0.174	3.325	0.001	0.806	1.240
SN	0.214	0.049	0.226	4.361	0.000	0.818	1.223
AT	0.145	0.047	0.159	3.111	0.002	0.847	1.180
SE	-0.044	0.041	-0.056	-1.089	0.277	0.838	1.194
PD	0.132	0.034	0.193	3.852	0.000	0.882	1.133
PF	0.053	0.041	0.070	1.285	0.200	0.735	1.360
PA	-0.083	0.037	-0.118	-2.237	0.026	0.792	1.262

Source: Analysis results from SPSS.

Based on the empirical research findings, it is evident that out of the seven research hypotheses examined, hypotheses H4 and H6 failed to attain the requisite level of significance. Conversely, hypotheses H1, H2, H3, H5, and H7 demonstrated a statistically significant relationship. Notably, the PA factor exhibited a negative influence on EI. In summary, the entrepreneurial intention of graduates in the MRD is influenced by several factors, including behaviour control, subjective norms, attitude toward entrepreneurship, perceived desirability, and propensity to act. It is worth noting that the propensity to act has a negative impact on entrepreneurial intention in this context.

5. Discussion, implications, and conclusions

5.1. Discussion

This research aimed to validate the integrated model of entrepreneurial intention, which combines A. Shapero, et al. (1982) [5] theory with I. Ajzen's (1991) [6] theory of planned behaviour. By administering

a survey to a sample of 341 graduates in the MRD at the end of 2020, the model's validation was conducted using a combination of factor analysis and regression techniques. The findings indicate that a majority of the respondents (39%) expressed their intention to engage in entrepreneurship. Notably, all graduates in the MRD had prior exposure to entrepreneurial courses, with accounting and international business emerging as the most popular subjects among them. This study also confirmed that the entrepreneurial intention of graduates in the MRD is influenced by several factors, including behaviour control, subjective norms, attitude toward entrepreneurship, perceived desirability, and propensity to act. These results are consistent with many previous studies such as [22-25].

Even more surprisingly, the regression results show that self-efficacy and perceived feasibility do not affect entrepreneurial intention. This is opposite to the previous results. This can be explained that educational background does not adequately prepare graduates in the MRD for entrepreneurship. If the curriculum and training they received did not include entrepreneurship education or practical skills needed for business startups, they may lack confidence in their abilities. Moreover, graduates may perceive that the market conditions in the MRD after the period of COVID-19 become unsafe, or their specific field of interest is unfavourable for entrepreneurship.

Similarly, several entrepreneurship researchers and scholars have proposed and tested the positive relation between the propensity to act and entrepreneurial intention. However, this study's regression result points out a negative relation. This means that graduates who are more inclined to take action or are more proactive in pursuing entrepreneurial opportunities are less likely to express an intention to become entrepreneurs. In other words, a higher propensity to act is associated with a lower likelihood of wanting to start a business. This finding is somewhat counterintuitive, as one might expect that a higher propensity to act would be positively correlated with entrepreneurial intention. However, there could be several reasons why this negative impact is observed. The first reason is fear of failure. Graduates in the MRD who have a high propensity to act may also be more aware of the risks and challenges associated with entrepreneurship. They might fear failure and be less inclined to express an intention to become an entrepreneur due to

concerns about potential setbacks. The second reason comes from external factors. External factors in the MRD region, such as economic conditions, lack of support infrastructure, or limited access to resources, could be discouraging individuals with a propensity to act from pursuing entrepreneurship. Understanding the reasons behind this negative impact of "Propensity to act" on entrepreneurial intention would require further research and analysis specific to the MRD region. It is also important for policymakers, educators, and business development organizations to consider these findings when designing programs and interventions to encourage entrepreneurship in the region. Efforts to support and empower graduates with a high propensity to act should focus on addressing their specific concerns and challenges to promote a more favourable environment for entrepreneurship.

In summary, it can be deduced that entrepreneurial intention is subject to multifaceted influences, wherein factors such as behaviour control, subjective norms, attitude toward entrepreneurship, and perceived desirability exert a positive impact, while the propensity to act demonstrates a negative effect.

5.2. Implications for enhancing entrepreneurial intention of graduates in the MRD

This assessment aims to shed light on the factors that shape the entrepreneurial intention of graduates in the MRD, with the overarching goal of enhancing the entrepreneurial ecosystem within the region and promoting the well-being of individuals aspiring to establish their own ventures. Based on the findings, the authors put forth the following actionable recommendations for various stakeholders: (1) policymakers, (2) universities, (3) entrepreneurs, and (4) researchers.

To the first point, the effectiveness of entrepreneurial policies hinges upon their capacity to shape attitudes and intentions. For these policies to be advantageous, it is imperative for government officials and politicians to enhance business policies and effectively disseminate information to the public using mass media as a platform. Moreover, it is necessary for the government to modify the SME Support Law, which covers a wide range of policy domains, including taxation, financial access, innovation, and value chain enhancement. This recommendation arises from the observation that certain aspects, like SME digitalisation, have not

received adequate focus, while in other areas, such as the formalisation of household businesses, the desired outcomes have not been achieved thus far.

Secondly, universities can cultivate a sense of assurance in the realm of new venture establishment through the establishment of dedicated entrepreneurship centres and a heightened emphasis on entrepreneurial coursework. Specifically, universities should leverage the influence of positive role models during instruction, intensify experiential learning opportunities that simulate real-world challenges inherent to the start-up process, and establish supportive networks comprising sponsors and mentors. It is noteworthy that the research findings underscore the limited popularity of business strategy education within universities. Given the significance of this discipline, the author advocates for an expansion of business strategy courses to equip graduates with the necessary skills to thrive in competitive markets.

Thirdly, entrepreneurs themselves would benefit from gaining a deeper understanding of the various factors that influence entrepreneurial intention. This comprehension enables them to adequately prepare for the personal requisites necessary for more effective new venture creation. Additionally, entrepreneurs should strive to grasp their motivations, as the lens of intentions allows them to discern the underlying reasons behind their resolute choices in shaping their vision for the new venture.

Finally, researchers should prioritize the undertaking of extensive empirical investigations while concurrently enhancing the theoretical foundations underpinning entrepreneurial intention. This dual approach aims to yield a comprehensive research model that encompasses the most influential factors contributing to entrepreneurial intention.

5.3. Conclusions and suggestions for future research

Drawing upon previous studies and existing models, this research endeavour has proposed a cohesive research model elucidating the entrepreneurial intention of graduates in the MRD. Through the utilization of EFA and regression techniques, the study's findings indicate that five factors-namely, (1) attitude toward the behaviour, (2) subjective norm, (3) perceived

behavioural control, (4) perceived desirability, and (5) propensity to act-significantly influence the entrepreneurial intentions of graduates. Notably, it is observed that only the propensity to act exhibits a negative influence. These factors pertain to individual and psychological aspects, implying their susceptibility to regulation through education and policy instruments. Consequently, it becomes imperative to provide support to graduates in establishing their own businesses and nurturing their entrepreneurial competencies. Furthermore, universities should implement measures such as entrepreneurial education, entrepreneurial skill training, fostering appropriate risk propensity, cultivating an encouraging and supportive atmosphere, establishing entrepreneurial funds, and facilitating the incubation of graduates' entrepreneurial ventures. By adopting this strategic approach, the entrepreneurial environment within the MRD is anticipated to undergo transformation, thereby fostering the entrepreneurial intentions of graduates and effectively promoting employment through entrepreneurship.

The primary contribution of this study lies in its provision of an updated and cohesive framework that enhances comprehension of the entrepreneurial intention among graduates in the MRD. Nonetheless, certain limitations should be acknowledged. *Firstly*, the analysis primarily focuses on graduates within the MRD region, making it challenging to extrapolate the findings to different provinces or regions. To address this, future study is advised to encompass various provinces in Vietnam to account for the disparities in local governmental support, potentially yielding divergent results. *Secondly*, despite the rigorous review process applied to empirical studies on entrepreneurial intention within the MRD and globally, it is possible that some pivotal studies may have been overlooked, which could have contributed to the subject matter. Hence, future studies on graduates' intentions should incorporate new empirical research and explore additional factors specific to the MRD context that may influence entrepreneurial intention.

CRediT author statement

Tran Thi My Phuong: Literature Review, Data Collection, Methodology, and Writing manuscript; Phan Anh Tu: Literature Review and Data Analysis.

COMPETING INTERESTS

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

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Smart factories: Literature review and development prospects

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Abstract:

Smart factories have demonstrated the effectiveness in leading technological trends and enhancing social production efficiency. Consequently, smart factories have attracted the attention of not only business owners and policymakers but also scholars in many fields of research. However, the conception of a smart factory varies significantly depending on the approaches. This discrepancy translates into a notable divergence in creating a development strategy for a smart factory, encompassing aspects such as technology selection for investment, the enhancement of human resource strategies, and the overall development strategy for the entire enterprise. Furthermore, this disparity poses challenges in proposing a consistent science and technology policy to promote the trend of intelligent production. To address these shortcomings, the authors conducted an exhaustive literature review of published works on smart factories to establish a comprehensive concept and delineate the primary characteristics of smart factories, providing a fundamental framework for strategic planning and investment policies. This research offers a foundation for formulating a set of criteria to assess the intelligence of manufacturing factories.

Keywords: cyber-physical systems, industrial internet of things, intelligent manufacturing, smart factory.

Classification number: 2.2

1. Introduction

The creation and development of the smart factory have fundamentally transformed the production method of goods and services and created a revolution in industrial production, also known as the Fourth Industrial Revolution. In other words, the smart factory is the embodiment of the Fourth Industrial Revolution. Indeed, thanks to information technologies such as the Internet of Things (IoT), cyber-physical systems (CPS), and the integration of microprocessors for the processing centers (production cells), industrial production has transitioned from mass production methods and standard products to a mode that meets individual needs, with optimal output achieved automatically and requiring minimal or no human intervention.

Industrial production has made significant strides since the Third Industrial Revolution, characterised by digitisation and automation. However, automation has previously been applied at the level of individual

devices, with separate analysis and decision-making systems. The production system is not optimised, causing long response time and therefore can not be customised to meet the requirements. These shortcomings have spurred the advent of the Fourth Industrial Revolution and the emergence of the smart factory. That presents both a challenge and an opportunity for developing countries to keep up with future developmental trends.

A smart factory, when compared to today's factories, as displayed at the Hannover Fair, can be conceptualised as a facility that attains the level of digitisation and automation of the Third Industrial Revolution and has incorporated sensors, microprocessors, artificial intelligence (AI), and other modern technologies such as the industrial IoT and a management and monitoring system via CPS. This configuration enables the factory to self-collect data, self-analyse, and self-configure to meet flexible demands optimally in real time.

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Investing in a smart factory requires significant resources and time commitment, but it has become an investment trend for not only businesses but also national target programs in many developed countries. The primary advantages of investing in a smart factory include:

- Maintaining the leading position of developed countries and large enterprises or performing as a catalyst for the development of developing countries and enterprises.
- Assisting factories in lowering costs and improving product quality.
- Meeting the diverse needs of customers and adapting to changing environmental factors in real time.

Given the numerous benefits provided by smart factories, this article explores the scientific foundations of smart factories by searching and synthesising recently published scientific articles. The findings aim to offer policymakers and investors an overview and in-depth insights to inform their decision-making processes.

To gain an in-depth understanding of the current state of smart factories, the authors conducted searches in databases such as ScienceDirect.com, Web of Science, IEEE Xplore, and Springer. This search provided more than 100 publications, which were subsequently filtered and selected. Out of these, 49 publications were identified as closely related to smart factories and intelligent manufacturing. The publications were categorised based on their publication year and type (Figs. 1 and 2).

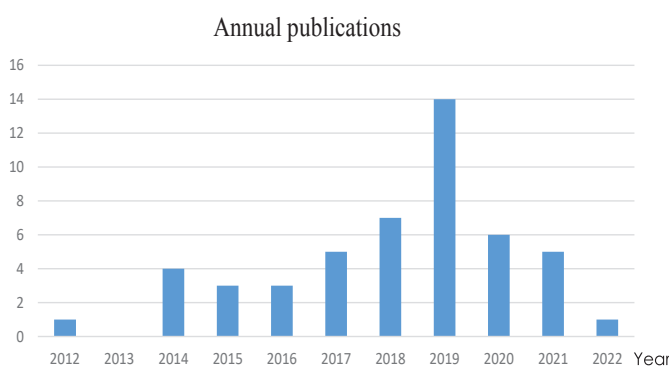


Fig. 1. Time distribution of smart factory publications.

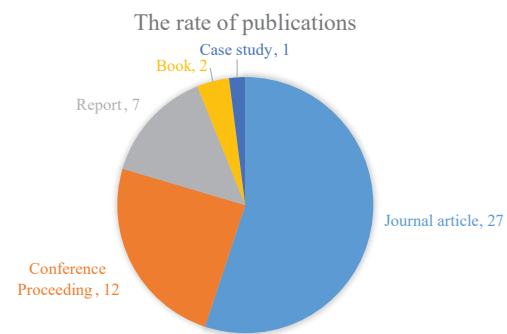


Fig. 2. Classification based on type of publication.

2. The driving forces of factory smartisation

Smart factories contribute to the enhancement of human resources quality. Indeed, with the systems being automated from data analysis to production operations, unskilled jobs will disappear. People who want to work in such systems must improve their skills to meet the increasing requirements of knowledge and strengthening proficiency. Additionally, smart factories play an important role in maintaining and strengthening a factory's competitive position within the industry by increasing its reputation with consumers, supplier partners, and society. However, deploying a smart factory is far from straightforward, particularly for developing countries. The main barrier currently is the scarcity of financial and human resources.

Firstly, investing in a smart factory creates long-term benefits rather than immediate returns. Given the substantial investment required, the payback period extends considerably. Moreover, the benefits are sometimes not shown in revenue but rather in intangible assets such as prestige and competitive position.

Secondly, in terms of personnel, the operation of a smart factory necessitates a highly skilled workforce, spanning from leadership to employees. As a result, this is a costly and time-consuming process because the existing human resources of traditional factories need to be retrained.

3. The concept of smart factories

The concept of smart factories plays an extremely important role as a framework for further research. After reviewing the gathered publications, it is evident that several perspectives exist regarding the concept of a smart factory, depending on one's

point of view. Based on the scope of influence and the level of conceptual detail, these viewpoints can be categorised into three major groups: the macro approach, the operational approach, and the technique and technology approach.

According to the technique and technology approach, a smart factory is defined as a factory equipped with smart devices and modern technologies, such as the IoT, CPS, sensors, and more. These components facilitate communication and data sharing, establishing a virtual system alongside the physical one, often referred to as the "twin towers". This approach offers the advantage of pointing out specific technologies and production facilities for smart factories. However, it tends to overlook considerations of investment efficiency as well as the macro and micro impacts associated with smart factories. B. Chen, et al. (2017) [1], assert that a smart factory combines physical and cyber technologies, deeply integrating previously independent discrete systems, thereby increasing the complexity and precision of involved technologies. In their article, the authors propose a smart factory architecture comprising four layers: the physical layer, network layer, application layer, and data layer. They also present a case study involving a candy food factory to substantiate their perspective on smart factories. Navid Shariatsadeh and colleagues define a smart factory as a digital factory combined with IoT, asserting that it represents a step towards a factory-of-things closely aligned with IoT. They emphasise that IoT not only handles intelligent connections among physical objects but also encompasses interactions with diverse IT tools deployed within the digital factory [2]. While their perspective underscores the technological aspect of smart factories, it overlooks the primary function of these factories, which is self-reconfiguration to adapt to changing customer demands and maximise factory profits. C.Y. Yoon (2019) [3] proposes a measurement scale for smart factories, assessing smart levels based on internal and external connectivity. Like other studies within the technique and technology approach, the focus lies on the necessary technologies for a factory to attain smart status without considering investment capital and its associated benefits [3-21].

The operational approach focused on operational efficiency, encompassing aspects like product quality, response time, and production organisational

flexibility. This group contends that a smart factory establishes comprehensive internal connectivity within the factory and links with customers and external partners. By autonomously gathering and analysing data, the system can engage in reconfiguration to optimally align with customer requirements and environmental parameters. The advantage of this approach is that it aims to satisfy the specific requirements of customers while simultaneously reducing production costs, maximising factory profits, minimising investment return time, and enhancing the factory's reputation. However, this approach does not specify where to allocate investments or consider the macroeconomic impact. J.W. Kyun, et al. (2021) [22] corroborate this perspective by stating, "In the manufacturing industry, the smart factory is considered the final stage of the Fourth Industrial Revolution. Manufacturing companies are pursuing breakthroughs by introducing various advanced technologies to ensure their competitiveness". Their study analysed data from diverse Korean SMEs and concluded that SMEs could enhance their competitiveness by investing in 4.0 technologies such as IOT and big data, thereby gaining the advantages of a smart factory, which fosters flexible manufacturing to compete with the economies of scale of larger enterprises. M. Mohammed, et al. (2018) [23] defines a smart factory as one that "integrates 4.0 technologies to improve performance, quality, controllability, and transparency of manufacturing processes.

In the smart factory, the system is context-aware and helps people and machines execute their tasks based on information from both physical and virtual worlds. Components of the system can negotiate with each other and with other factory components to either request or offer functions". According to scholars, a smart factory encompasses multiple 4.0 technologies that facilitate the connection of people, machines, and context-aware systems. The emphasis is on improving factory operational parameters regardless of the specific technologies employed, as long as the system can be context-aware across all operational facets, rendering the factory "smart". This approach assists enterprises in adjusting their investments to align with available resources and updating suitable technologies [24-33].

The macro approach defines a smart factory as one capable of swiftly and optimally meeting

customer needs, thereby conserving societal resources, safeguarding the environment, maintaining a competitive edge, and enhancing the industry and the nation's competitiveness. This approach is characterised by its focus on long-term objectives and broad scope, but it poses challenges for small and medium enterprises (SMEs), especially those with limited potential. As described by J. Lee (2015) [33], in a smart factory, manufacturers have the capability to meet customer specifications at any production rate, accommodating last-minute production changes and offering flexibilities far beyond the reach of traditional factories. The author also analyses the benefits of a smart factory for related stakeholders and its socioeconomic impact. Some developed country governments have recognised the advantages of smart factories and have initiated strategies to foster their growth. "German and US governments have established separate initiatives to accelerate the use of the IoT and smart analytics technologies in the manufacturing industries and, consequently, to improve the overall performance, quality, and controllability of manufacturing process. The smart factory is the integration of all recent IoT technological advances in computer networks, data integration, and analytics to bring transparency to all manufacturing factories" [34-38].

While authors may hold varying views on smart factories, each offers their unique perspective and definition. After carefully analysing their interpretations and definitions, we have inferred a comprehensive definition of a smart factory as follows: "A smart factory is a factory equipped with automatic machines, facilities, sensors, and experienced people. The human-machine system is interconnected, as well as connected to external entities, so that the factory can automatically or semi-automatically collect and analyse information about the environment, customers, and partners. The system has the ability to self-configure or self-reconfigure accordingly to optimise the production process, save resources, protect the environment, and improve the competitiveness of the factory as well as the industry and the country".

4. The symbols of a smart factory

Smart factories deliver daily benefits to enterprises and contribute to their long-term development, as well as the advancement of industries and nations. However, the utilisation of smart factories

is a challenging progress that demands substantial resources, including human, financial, and temporal investments. J. Stamper (2019) [39] conducted a survey involving 204 European manufacturing enterprises, revealing that only 28% of manufacturers had integrated smart factory practices, with an additional 29% planning to do so within the next three years. This survey also concluded that one of the major challenges with smart factory projects is the significant level of investment required. Initially, smart factories may progress relatively slowly for large global manufacturers, due to the substantial initial investment. Consequently, it is critical to identify the key characteristics of smart factories, as these will serve as an analytical framework for building smartisation metrics and making utilisation smart factory strategy.

Based on reviewed papers, smart factory recognition symbols are affirmed as follows:

- *Production facility and technology*: Machinery, processing units, and production facilities (including conveyor belts and vehicles for transporting materials and work-in-progress) must be digitised and computer-controlled (often using embedded computers). This empowers these devices to collect and process data, make optimal decisions, and communicate with other production units and the factory's central system to acquire and share information.

- *Modularisation*: Unlike conventional factories, the smart production system is composed of small modules (or processing centers), each of which can work independently or in combination with others to form a complete production line. Modularisation facilitates flexible manufacturing because these modules can be rearranged and reconfigured to make a fast and efficient production for new products.

- *Connectivity*: Every piece of equipment in a smart factory is linked to sensor systems and the factory's network. Each device has an identifier within the network, enabling it to exchange data with other equipment and the factory's operating system. Devices can also self-configure based on received information or be remotely configured through a CPS network. CPS can be illustrated as a physical device, object, or equipment translated into cyberspace as a virtual model. This virtual model,

with networking capabilities, can monitor and control its physical counterpart, while the physical aspect sends data to update its virtual counterpart.

- *Operation*: An integrated production management system, including planning, implementation monitoring, data collection, processing, and automatic and semi-automatic decision-making, must be implemented in the factory. This system must also be interconnected with partners and customers to respond promptly and efficiently to changing working environments.

- *Human resources*: A smart factory requires well-trained employees with the capacity to work and make decisions within highly automated systems. These employees should also possess skills in operating and handling situations involving automation and remote-control programming.

- *Performance*: In a smart factory, the manufacturing system can configure itself to customise the operation of each individual product based on the current status of all machines involved in the production line. This ensures high-quality production with optimal operational costs. Such smart factories enable manufacturers to meet customer specifications at any production rate, accommodating last-minute production changes and offering flexibilities beyond what traditional factories can achieve. Additionally, a smart factory can autonomously respond to changes in internal and external factors to optimally meet the demands of all stakeholders.

5. Conclusions

This article has provided a general concept and the principal characteristics of a smart factory after conducting an extensive review of published and synthesised works. These are foundational prerequisites that can assist managers in crafting investment and development strategies while aiding policy-makers in designing policies to advance regional and national science and technology, and resource optimisation. However, the scope of this article is insufficient to comprehensively address this research problem, given its broad and interconnected nature. Issues such as the impact of smart factories on the integration of SMEs into the global supply chain, investment priorities, and the sequencing of investments for resource optimisation will be addressed in forthcoming articles.

CRediT author statement

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COMPETING INTERESTS

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

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Librarians' professional development needs in the digital age - A case study at the Learning Resource Centre - Can Tho University, Vietnam

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Abstract:

Professional development fulfils dual functions in fostering career advancement and enhancing staff retention. For librarians, this development becomes even more crucial to acquire the requisite skills and knowledge in the digital age. This study presents the professional development needs of staff at the Learning Resource Centre, Can Tho University, Vietnam. This study used C.P. Alderfer's Existence Relatedness Growth (ERG) Theory of Motivation - Existence, Relatedness, and Growth (1969) [1] as a theoretical framework. A mixed-method approach was utilised to determine the professional development requirements of the staff and the associated influencing factors. A survey questionnaire was disseminated to all 28 staff members (a 100% sample) of the Learning Resource Centre via online and in-person forms. Furthermore, fifteen individual interviews were conducted to obtain detailed insights. The research findings underscore that the majority of the staff at the Centre express a keen interest in professional development. Moreover, the research pinpointed three challenges affecting career development: budgeting (both self-financed and state-sponsored), time, and familial obligations. These results aid in formulating strategies to address the professional development necessities of staff at the Learning Resource Centre in the digital age. Additionally, the insights augment the compendium of reference resources for subsequent research in human resource management and devising strategies to retain highly skilled personnel.

Keywords: digital age, human resource management, professional development needs, staffing.

Classification number: 3.2

1. Introduction

Professional development holds paramount importance in ensuring career advancement and enhancing staff retention. The demand for librarians to equip themselves with novel skills and knowledge is even more pronounced in the digital era. Serving as an archetype of a modern library in Vietnam, the Learning Resource Centre (LRC) at Can Tho University (CTU) has significantly bolstered the university's staff training and education programs. The LRC staff has continually innovated their approaches to address patrons' expectations and overcome escalating challenges. With CTU's mission to establish a digitally advanced university, the LRC confronts pivotal questions: What novel expertise and skills must the

LRC staff cultivate? How can the LRC workforce be primed for this digital metamorphosis?

This study aims to address these queries from a professional development perspective.

The findings of this research will offer invaluable insights to staff members, the LRC's administrative body, and CTU at large. Through this, staff members will better understand their role in library services, motivating them towards excellence. LRC management can cultivate and sustain their workforce by endorsing their professional development. Finally, the University, especially its human resources sector, will thereby discern the instructional requirements of its employees and can consequently tailor its training schemes.

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2. Literature review

Many theories have explored human needs, spanning from A.H. Maslow's Theory (1943) [2], F. Herzberg, et al.'s Two-Factor Theory (1959) [3], V.H. Vroom's Expectancy Theory (1964) [4], to C.P. Alderfer's ERG Theory (1969) [1]. While these theories furnish diverse perspectives on employee necessities, their overarching objective is to facilitate optimal performance. Alderfer's ERG theory resonates profoundly with the research objectives. Conceived by Clayton Alderfer, a renowned psychologist at Yale University, this theory sought to refine and expand upon Maslow's theory. Although the ERG theory parallels many tenets of Maslow's framework, it possesses distinct nuances. ERG encapsulates three cardinal human needs: "Existence", "Relatedness", and "Growth". "Existence" encompasses both physical and psychological imperatives for survival, including hygiene and safety. "Relatedness" is the desire for social bonds with peers, family, and supervisors, acknowledging that every individual upholds varied relational dynamics. The "Growth" need signifies an intrinsic drive to evolve both personally and professionally. On the whole, Alderfer's ERG theory provides a comprehensive and adaptable framework for examining the complexities of human motivation in the context of professional development. Its nuanced recognition of multifaceted needs, the interplay between these needs, and its practical implications for organizational practices make it an indispensable tool for researchers keen on comprehending and augmenting professional trajectories.

2.1. The need for professional development in the digital age

Previous studies have shown a strong demand for library staff's professional development in the digital age. D.L. Truong, et al. (2015) [5] asserted that library professionals are mandated to pursue professional development, adhering to both university and national benchmarks. Concurrently, T.H. Nguyen (2011) [6] found a unanimous consensus among surveyed Vietnamese information agencies regarding the indispensability of professional training. Elaborating further, T.T.M. Nguyen, et al. (2013) [7] ascertained that an overwhelming 90% of public libraries surveyed harboured a profound need for professional staff training.

2.2. Difficulties in professional development

The journey towards digital transformation for library staff is riddled with complexities. M.C. Dinh (2010) [8] reported on librarians' time constraints and their struggles to assimilate rapidly evolving digital technologies during the lengthy and expensive modernisation process of their libraries. In addition, T.K. Pham (2011) [9] identified four essential areas for librarians to navigate the digital transformation process. They are: knowledge of informatics and marketing proficiency, international collaboration, professional development, as well as growth, creativity, and work ethic. D.L. Truong, et al. (2015) [5] critiqued training programs for their static formats, noting an absence of interactive modules like presentations and quizzes. V.H. Do (2018) [10] further pointed out that these training programs are too theoretical and lack hands-on practices. Moreover, D.H. Nguyen (2018) [11] advocated for librarians to independently train themselves on contemporary competencies to align with evolving societal paradigms, citing the absence of formalised policies. Beyond professional knowledge and skills, T.K.A. Vu, et al. (2019) [12] stressed the necessity for library staff to master marketing and managerial skills. Resource constraints exacerbate these challenges. H.G. Nguyen (2018) [13] pinpointed resource deficiencies as impediments to optimal staff performance, while H. Hoang, et al. (2020) [14] observed librarians grappling to keep up with new technologies and trends due to obsolete equipment and archaic software.

3. Methodology

This mixed-methods research utilises both surveys and interviews for data collection. A survey questionnaire was distributed to 28 LRC staff (a 100% sample), both in person and online. Fifteen individual interviews were conducted to collect in-depth data. SPSS statistical software was employed to analyse the quantitative data. Descriptive statistics, such as frequency, percentage, and mean, were used to comprehend the needs for and challenges of professional development articulated by the respondents. The qualitative data were analysed to identify themes and potential solutions proposed by the participants.

4. Findings

4.1. LRC staffs' needs for professional development

Over 80% of LRC staff, as illustrated in Table 1, expressed a need for professional development (82.1%, n=23). Moreover, the demand for professional development varies by job category. For Administrative (AD) staff, two-thirds of them wish to advance their careers (n=9; 69.2%). For Information Resources (IR) and Information Technology (IT) staff, 100% expressed the need. Information Services (IS) staff demonstrated a slightly higher demand for professional development than the overall percentage (83.3%; n=5). This data is further reinforced by insights from the in-depth interviews. Thirteen of the fifteen interviewees emphasised that professional development enables them to meet job requirements and career aspirations, which in turn indirectly augments the library's service quality

Table 1. Professional development needs by job categories.

Staff	Administrative (AD)		Information resources (IR)		Information services (IS)		Information technology (IT)		Total	
	n	%	n	%	n	%	n	%	n	%
No	-	-	-	-	-	-	-	-	-	-
Unsure	4	30.8	-	-	1	16.7	-	-	5	17.9
Yes	9	69.2	6	100	5	83.3	3	100	23	82.1

Source: Authors' survey in March 2022.

Table 2 summarises the objectives of professional development as articulated by survey participants. Among these objectives, aligning with new professional standards was ranked as the paramount reason for professional development (n=21, 75.0%).

Specifically, 11 AD staff (84.6%) and 5 IR staff (83.3%) viewed it as the most vital reason for professional development. This observation underscores the pivotal role of library staff in propelling library technology to align with new professional standards, as posited by T.H. Phan (2011) [15]. Another equally significant objective for professional development is the integration of new processes and technology. The advent of information technologies has profoundly transformed library operations. A majority 60.7% of LRC staff pinpointed that embracing new processes and technologies is the second most pressing reason for professional development.

Table 2. Motives for professional development by job category.

Purposes	AD		IR		IS		IT		Total	
	n	%	n	%	n	%	n	%	n	%
New professional standards	11	84.6	5	83.3	4	66.7	1	33.3	21	75
New process & technology	10	76.9	1	16.7	4	66.7	2	66.7	17	60.7
New challenges & purposes	8	61.5	2	33.3	4	66.7	2	66.7	16	57.1
Promotion opportunity	8	61.5	3	50	3	50	2	66.7	16	57.1
Self-actualization	4	30.8	3	50	3	50	1	33.3	11	39.3
New regulations	3	23.1	3	50	-	-	-	-	6	21.4

Source: Authors' survey in March 2022.

The challenges of establishing new work objectives and promotion opportunities are esteemed by 57.1% of LRC staff as another essential reason for professional development. In terms of challenges, there was a robust consensus of 66.7% among IS (n=4) and IT (n=2) staff. In the context of promotion opportunities, a noteworthy approval rate was observed from LRC staff, reaching up to 50% among IS and IR divisions. Approximately 39.3% of LRC staff (n=11) acknowledge that self-actualisation represents one of their developmental goals. Specifically, 30.8% (n=4) of AD staff and 33.3% (n=1) of IT staff pursue professional development as an avenue to manifest their competencies. However, this objective registered relatively modest agreement compared to the others. It is possible that staff recognise alternative avenues to demonstrate their capabilities beyond professional development.

Table 3. Professional development methods.

Methods	AD		IR		IS		IT		Total	
	n	%	n	%	n	%	n	%	n	%
Library tour, meeting, talks	9	69.2	3	50	4	66.7	2	66.7	18	64.3
Short training course	7	53.8	3	50	4	66.7	2	66.7	16	57.1
Higher education (higher qualifications)	6	46.2	5	83.3	3	50	2	66.7	16	57.1
National workshop and conference	5	38.5	1	16.7	4	66.7	1	33.3	11	39.3
International workshop and conference	6	46.2	3	50	2	33.3	-	-	11	39.3

Source: Authors' survey in March 2022.

Regarding professional development methods, the majority of LRC staff favour the approaches suggested in Table 3. Among the five professional development methods, attending international workshops and conferences was the least popular option among survey participants, mainly due to financial and other practical considerations. For AD, IS, and IT staff, library tours, meetings, and talks were perceived as the most effective approach, with strong agreement from 69.2% (n=9) of AD, 66.7% (n=4) of IS, and 66.7% (n=2) of IT staff. Additionally, 53.8% of AD (n=7), 66.7% of IS (n=4), and 66.7% of IT staff (n=2) preferred attending short-term training courses as their second choice for professional development. Furthermore, obtaining an advanced degree was highlighted as a viable pathway for career advancement, as noted by survey participants. This perspective was most notably supported by 46.2% (n=6) of AD and 50% (n=3) of IS staff. Specifically, a significant portion of AD and IR staff, 83.3% (n=5) and 66.7% (n=2) respectively, endorsed pursuing higher degrees. Lastly, participation in international conferences and workshops emerged as the least favoured option due to time, finances, and travel commitments, which is understandable. Overall, LRC staff exhibit a high and diverse interest in professional development, and the LRC administration should be cognisant of this keen interest reflected in the survey results. An educated and upskilled staff will likely enhance their work in alignment with contemporary career standards, staying abreast of societal trends.

Table 4 reveals an intense desire among LRC staff towards acquiring postgraduate degrees. Specifically, 5 AD (38.5%), 2 IT (33.3%), and 2 IR staff (66.7%) expressed interest in pursuing a master's degree. Concurrently, the aspiration to undertake doctoral studies was exclusively observed within the IR division (50%, n=3). Moreover, there were 5 LRC staff who remained undecided regarding their professional development aspirations and career trajectory (Table 1), or sought alternative means to acquire learning skills and qualifications. Distinctly, data from the open-ended questions in the survey highlighted a desire among LRC staff to refine their soft skills and capabilities in managing diverse information resources, improve communication abilities, outreach, marketing expertise, and remain updated on programming languages, professional frameworks, and databases. This data underscores

the LRC staff's relentless drive to enhance their knowledge and aptitudes in addressing challenges of the digital epoch.

Table 4. Improving qualifications.

Staff Degree	AD		IR		IS		IT		Total	
	n	%	n	%	n	%	n	%	n	%
Bachelor	1	7.7	1	16.7	3	50	-	-	5	17.9
Master	5	38.5	2	33.3	-	-	2	66.7	9	32.1
PhD	1	7.7	3	50	2	33.3	-	-	6	21.4
Other	6	46.2	-	-	1	16.7	1	33.3	8	28.6

Source: Authors' survey in March 2022.

4.2. Difficulties to LRC staff's professional development

Data from Table 5 shows the obstacles to professional development encountered by survey respondents. Specifically, the most prominent hurdle for LRC staff is self-financing their career progression, especially among those who are married. Twelve LRC staff concurred (42.9%), while 10 others were in strong agreement (35.7%) with this predicament (mean=4.14). During the in-depth interviews, 10 of the 15 LRC staff members indicated that they individually save funds to finance their pursuit of advanced degrees. Familial obligations also emerged as a significant challenge, with an agreement rate of 39.3% (mean=4.0) and only one staff member (3.6%) opposing this view. Notably, all fifteen interviewees acknowledged the supportive roles their spouses play in managing familial responsibilities, enabling them to focus on their studies. Time management emerged as another prominent challenge, with 60.7% (n=17, mean=4.04) citing it. This observation resonates with M.C. Dinh's assertion (2010) [8] that library staff require considerable time to align with evolving standards in the digital era. Pertaining to time management, 13 of the 15 interviewees divulged plans to undertake advanced studies during weekends or evenings. One IR staff member remarked:

"We expected library leader could deal with the University Board of Trustees to let us study full-time. If we are in charge of library work full-time while pursuing advanced degrees part-time, we are so exhausted and stressed" (Interviewee 3, IR Division).

Table 5. Obstacles to professional development.

Difficulties	Agreement scale		(1)		(2)		(3)		(4)		(5)		Mean	Rank
	n	%	n	%	n	%	n	%	n	%	n	%		
Self-finance	-	-	-	-	6	21.4	12	42.9	10	35.7	4.14	1		
Time	-	-	-	-	5	17.9	17	60.7	6	21.4	4.04	2		
Family obligations	-	-	1	3.6	7	25	11	39.3	9	32.1	4.00	3		
Library budget	-	-	1	3.6	9	32.1	11	39.3	7	25	3.86	4		
IT and foreign language capacity	-	-	3	10.7	7	25	12	42.9	6	21.4	3.75	5		
National policy	-	-	3	10.7	8	28.6	11	39.3	6	21.4	3.71	6		
Marketing capacity	1	3.6	1	3.6	9	32.1	11	39.3	6	21.4	3.71	6		
Management	-	-	3	10.7	6	21.4	16	57.1	3	10.7	3.68	7		
Equipment	-	-	4	14.3	11	39.3	5	17.9	8	28.6	3.61	8		
Research of other major	2	7.1	1	3.6	11	39.3	9	32.1	5	17.9	3.50	9		
Training curriculum	-	-	4	14.3	11	39.3	8	28.6	5	17.9	3.50	9		
International standard	-	-	4	14.3	15	53.6	7	25	2	7.1	3.25	10		
Personal capacity	-	-	1	3.6	12	42.9	12	42.9	3	10.7	3.15	11		

Source: Authors' survey in March 2022.

Moreover, interdisciplinary knowledge and skills are viewed as barriers to career advancement. Updated knowledge, computer expertise, and foreign language proficiency garnered the agreement of 42.9% (n=12, mean=3.75) of LRC staff. This observation resonates with T.K. Pham's assertion (2011) [9] that finance and time are paramount challenges in professional development, which library staff must surmount to elevate their workplace performance.

Regarding external challenges, funding constraints emerge as the predominant hindrance in the professional progression of LRC staff, with 39.3% (n=11) in agreement and 25% (n=7) in strong agreement, yielding a mean=3.86. This aligns with B. Yen's study (2019) [16], suggesting that in Vietnam, state budget allocations for libraries fall short of sufficiently supporting academic libraries. Augmented financial backing from the government is pivotal for enhancing academic library services. In the comprehensive interviews, thirteen of the fifteen respondents proposed exploring grant-funded projects from global institutions. A mere two could

independently finance their tuition. For instance, one IT staff commented, *"Whenever I contemplate pursuing advanced degrees, I initiate savings, thus finance isn't a hurdle for me"* (Interviewee 9, IT Division).

State-induced challenges include subpar training programmes and ambiguous policies, with respective means of 3.50 and 3.71. D.L. Truong, et al. (2015) [5] highlighted a predominant focus on theoretical instruction in librarian training. Nevertheless, over the past half-decade, curricula at Vietnamese library institutions, particularly the more prominent ones, have undergone substantial revisions in content and pedagogy, accentuating contemporary skills. Marketing aptitude presents another hurdle, with 39.3% (n=11) of LRC staff identifying it. In the digital epoch, library professionals must hone communication and marketing proficiencies to foster a "reading culture" amongst digital-native youths. In this digital environment, reading transcends physical books, encompassing digital screens and online platforms. While university libraries play a pivotal role in promoting and developing reading culture, their cardinal focus should be on developing students' information literacy. Additionally, LRC staff members further pointed out the challenges associated with outdated technology and software (mean=3.61), and the need to refine skills for scientific research (mean=3.5), revealing hurdles in addressing users' scientific research requirements. Contrary to T.K. Pham's perspective (2011) [9], adhering to international standards such as AACR2, DDC, and Marc21 poses a significant challenge, receiving a neutral stance from LRC staff (mean=3.25, 53.6%, n=15), with 14.3% (n=4) dissenting. The lesser gravity assigned to this challenge might stem from the integration of these international standards into LRC operations since the 2000s.

4.3. Solutions to meet professional development needs of LRC staff

To improve the quality of library services, rigorous staff training is imperative. The top three solutions identified by LRC staff encompass training programmes, coherent policies, and conducive physical and psychological environments (Table 6). Pertaining to training, such initiatives empower staff

Table 6. Strategies for professional development.

Solutions	Agreement Scale		(1)		(2)		(3)		(4)		(5)		Mean	Rank
	n	%	n	%	n	%	n	%	n	%	n	%		
Training program	-	-	-	-	3	10.7	12	42.9	13	46.4	4.36	1		
Clear policies	-	-	-	-	3	10.7	12	42.9	13	46.4	4.36	1		
Mental & Physical conditions	-	-	-	-	3	10.7	12	42.9	13	46.4	4.36	1		
Updating curriculum	-	-	-	-	4	14.3	12	42.9	12	42.9	4.29	2		
Individual learning	-	-	1	3.6	3	10.7	12	42.9	12	42.9	4.25	3		

Source: Authors' survey in March 2022.

to strengthen their expertise, refine competencies, and share insights through short and extended training schedules and conferences, with a mean=4.36, agreement from 42.9% (n=12), and strong consensus from 46.4% (n=13). This finding affirms T.X.P. Huynh's viewpoint (2011) [17] that developing specific training programs will help library staff improve their proficiency. Regarding cogent policies, 42.9% (n=12) of LRC staff concurred and 46.4% (n=13) strongly concurred (mean=4.36). This finding supports T.K. Pham's conclusion (2003) [18] emphasising the necessity for the state to implement well-defined policies on education and training. Initiatives addressing physical and emotional well-being registered a mean of 4.29. Specifically, there was parity in the number of LRC staff who agreed or strongly agreed (n=12, 42.9%) with this solution was equal (n=12, 42.9%). Creating physical and emotional conditions possessing suitable resources and encouragement can invigorate their professional commitment to the library. In the exhaustive interviews, eleven out of fifteen interviewees claimed that the Trade Union shoulders the responsibility of ensuring the well-being of their staff, fostering an environment conducive to pursuing higher education.

Another pivotal strategy involves revising the library training curriculum. Presently, library training programmes are overly theoretical, with a notable dearth of practical applications [10]. Consequently, the urgency to refresh training methods and programmes cannot be overstated (mean=4.29,

42.9%; n=12). This observation is consistent with T.T.H. Hoang's study (2017) [19], which advocates for training units to revitalise their training methodologies and curricula, concentrating more on specialised skills rather than mere theory.

Furthermore, self-directed learning emerges as a pragmatic and significant solution. A substantial 85% of LRC staff endorsed this approach (mean=4.25). Autonomy characterises self-directed learning; staff govern their schedules, steer the learning trajectory, and make independent decisions concerning their education. This aligns with H.C. Minh's assertion (1947) [20] which champions self-directed learning as the cornerstone of an individual's lifelong educational odyssey.

5. Conclusions

The results of this study illuminate the prevalent professional development aspirations among LRC staff. Furthermore, the study identified three primary obstacles to professional advancement: personal and state financing, time constraints, and familial commitments. The paramount strategies to address professional development necessities encompass training programmes, lucid policies, and fostering conducive physical and emotional environments. Prioritising staff's professional development requisites are instrumental in refining library services and retaining adept professionals. These insights not only contribute to the understanding of professional development needs of personnel at the LRC but also serve as a foundation for more comprehensive and nuanced investigations into the professional growth needs of library personnel. Such research will invariably enhance human resource development and catalyse the successful digital evolution of the library sector in Vietnam.

CRedit author statement

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COMPETING INTERESTS

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

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Factors affecting students' learning outcomes at the Faculty of Economics and Business Administration, An Giang University

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Abstract:

The knowledge economy stands as one of the development strategies pursued by every nation. Constructing a knowledge-based economy hinges on four pillars: the environment, the education system, the information infrastructure, and the innovation system. Consequently, education plays an integral role, particularly at the university level. To evaluate the educational process at universities, the academic achievements of students are consistently considered. Currently, across universities in general and An Giang University in particular, there is an escalating number of students experiencing poor academic performance, which leads to academic indebtedness, re-examinations, and delayed graduation. Hence, there is an imperative need to investigate the factors influencing students' learning outcomes within the Faculty of Economics and Business Administration at An Giang University. The primary objective of this study is to identify the factors that impact students' learning outcomes and propose measures for enhancing these outcomes. The research encompasses two phases: qualitative research and quantitative research. Following the survey and data cleansing procedures, the sample size for analysis comprises 350 observations. The analysis outcomes reveal that four variables exhibit a positive correlation with students' learning outcomes: family and societal factors, scholarships, infrastructure, and motivation. The results of this research are intended to serve as practical documents that can assist academic leaders in making informed decisions to enhance the quality of education within the faculty.

Keywords: An Giang University, family and society, infrastructure, learning outcome, motivation, scholarship.

Classification numbers: 3.3, 3.4

1. Introduction

In recent years, a knowledge-based economy has emerged as the prevailing development strategy in both developed and developing nations, including Vietnam. A knowledge-based economy, also referred to as a knowledge-driven economy, is characterised by its heavy reliance on knowledge, scientific advancements, and high-tech innovations. This economic paradigm places a growing emphasis on the production, dissemination, and utilisation of knowledge and information OECD (1996) [1]. It defines a knowledge economy as one in which knowledge's creation, dissemination, and utilisation are the principal catalysts for growth, wealth generation, and employment across all sectors of the economy APEC (2000) [2]. Building a knowledge-based economy hinges on four foundational pillars: the environment, the education system, the information infrastructure, and the innovation system. Among these pillars, education holds a pivotal role, particularly in higher education.

Universities represent the cherished aspiration of the majority of students, who are regarded as the future custodians of their nation. Higher education consequently garners considerable attention from the state, as it is viewed as one of the most indispensable and influential forms of education. The rationale behind this perspective is that young individuals undergoing higher education acquire enhanced skills, experiences, and a heightened level of knowledge that can be harnessed for their economic and social advancement. Universities frequently rely on the outcomes of student learning to gauge the effectiveness of their educational processes. As per N.D. Chinh (2009) [3], learning outcomes encompass the levels of knowledge, skills, and awareness that learners attain in a specific field or subject. Therefore, academic performance assumes a paramount role in shaping a student's employment prospects, opportunities for promotion, entrepreneurial potential, capacity for

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further learning, research during graduation, and professional correspondence. It, in essence, reflects the educational excellence of the institution where the student is enrolled.

Student learning outcomes are subject to a multitude of objective and subjective factors. Objective indicators comprise elements such as institutional facilities, part-time employment [4], social networks [5], living conditions, and more. Family circumstances [6], and the teaching styles of educators [7] also exert objective influences. Subjective determinants include learning attitudes, study methods [6], and students' cognitive capabilities [8].

Furthermore, at present, there is a discernible upward trend in the percentage of students with poor academic performance at universities in general and An Giang University in particular, with figures rising from 32.14 to 33.24% (Table 1). This predicament demands attention, and proactive measures must be adopted to assist students in achieving improved academic performance. In the present context, An Giang University holds membership within Vietnam National University, Ho Chi Minh City (VNU-HCM), reflecting its commitment to raising the calibre of education at the institution to accurately mirror its newfound position and role as an university member of VNU-HCM. To achieve the overarching objective of enhancing the quality of education, educational institutions and departments must endeavour to elevate student learning outcomes. Thus, it becomes imperative to explore strategies aimed at aiding students, particularly those within the Faculty of Economics and Business Administration, in enhancing their academic achievements - a subject that warrants careful consideration within the academic purview of An Giang University.

Table 1. Data on academic warnings and expulsions for 2019-2022.

Semester	Academic warning	Forced to quit school	Faculty of Economics - Business Administration		Ratio (%)	
			Academic warning	Forced to quit school	Academic warning	Forced to quit school
Semester 1, 2019-2020	140	194	45	53	32.14	27.32
Semester 2, 2020-2021	151	144	49	41	32.45	28.47
Semester 1, 2021-2022	692	69	230	13	33.24	18.84

Source: Compiled from An Giang University's notice of academic processing review.

Therefore, with the increasing number of academic warnings within the Faculty of Economics and Business Administration at An Giang University, there is a pressing need to investigate the factors influencing the learning outcomes of students in this faculty. This study aims to identify the factors affecting the learning outcomes of students in Economics and Business Administration in the evolving context of An Giang University's affiliation with VNU-HCM.

Research objective: The research seeks to explore the factors that impact the learning outcomes of students in the Faculty of Economics and Business Administration at An Giang University.

Research questions:

1. What factors influence the learning outcomes of students in the Faculty of Economics and Business Administration at An Giang University?
2. To what extent do these factors affect the learning outcomes of students in the Faculty of Economics and Business Administration at An Giang University?
3. What recommendations can be provided to enhance the learning outcomes of students in the Faculty of Economics and Business Administration at An Giang University?

2. Theoretical background

2.1. Learning outcomes

The concept of learning outcomes, often referred to as academic outcomes or learning achievements, is well-established, yet various studies offer different interpretations.

Learning outcomes have consistently been intertwined with educational activities and have been a subject of extensive research. N.E. Gronlund (1985) [9], in his work "Measurement and Evaluation in Education," defines learning outcomes as follows: "The purpose of education is student progress. It is the result of learning that changes student behaviour." This definition underscores that learning outcomes manifest changes in learners' behaviour following the entire learning process.

K. Kraiger, et al. (1993) [10] elaborate that learning outcomes encompass language proficiency, knowledge structuring, and cognitive planning.

S. Adam (2006) [11] characterises learning outcomes as what learners aim to comprehend, know, and demonstrate after their educational experience. It is also defined as the amalgamation of knowledge, skills, and attitudes acquired through a specific

learning journey. Upon entering a university, students often anticipate the institution's teaching quality, a conducive learning environment, and a highly qualified faculty that can impart their expertise. They expect this to translate into commendable academic results and enhanced employment prospects.

In the words of N.D. Chinh (2009) [3], "A learning outcome is the level of knowledge, skill, or awareness that a learner achieves in a particular field (subject)". Hence, learning outcomes represent the accumulation of knowledge attained by learners.

From the definitions provided above, it becomes evident that primary learning outcomes generally signify the extent to which learners accumulate and apply knowledge during their educational journey. Simultaneously, learning outcomes also reflect alterations in learners' perceptions, attitudes, and behaviours as a consequence of active learning. In this study, the authors adopt the concept of learning outcomes as articulated by S. Adam (2006) [11].

2.2. Evaluation of learning outcomes

In 1956, B.S. Bloom, et al. (1956) [12] authored the seminal work "A Taxonomy of Educational Objectives," wherein he delineated six levels of cognitive processes: Remember, Understand, Apply, Analyse, Evaluate, and Create. Benjamin Bloom's taxonomy categorises cognitive engagement from elementary to advanced, with each level corresponding to a distinct cognitive competence. Consequently, students can gauge their own level of knowledge or learning accomplishment by referencing Bloom's six levels.

Moreover, as per Hamer's perspective, learning outcomes are appraised through course outcomes as indicated by L.D. Hai (2016) [13]. According to T.T.T. Oanh, et al. (2006) [14], the assessment of learning outcomes involves the systematic gathering and analysis of information acquired during the pursuit of learning objectives. This process furnishes a foundation for educators and learners to make informed decisions geared towards enhancing learning outcomes. Assessment outcomes are expressed using predetermined scales, such as daily learning assessments, mid-term examinations, and final exams.

The authors contend that the assessment of learning outcomes constitutes a composite process encompassing both student self-assessment and teacher-mediated assessment using predefined scales. Its fundamental purpose is to assist learners

in reviewing the knowledge they have acquired, facilitating the timely supplementation of any missing knowledge, and furnishing educators with the requisite insights to tailor their instructional strategies for the improvement of student learning outcomes. In the context of this study, the authors embrace the notion of evaluating learning outcomes in line with the frameworks of B. Bloom and T.T.T. Oanh.

3. Research model

Drawing upon a comprehensive review of prior research concerning factors influencing student learning outcomes and grounded in the theoretical underpinnings of prior research models, each study exhibits variables that align with variations in research domain, scope, objectives, and real-world conditions. In this particular investigation, the authors have analysed the factors impacting the learning outcomes of students within the Faculty of Economics and Business Administration at An Giang University (Fig. 1). These factors include: (1) Personal performance, (2) Enthusiasm for learning, (3) Learning motivation, (4) Learning method, (5) Teaching method, (6) Scholarship, (7) Infrastructure, (8) Management of the Faculty of Economics and Business Administration, (9) Peer influence, and (10) Family and societal influence (Table 2).

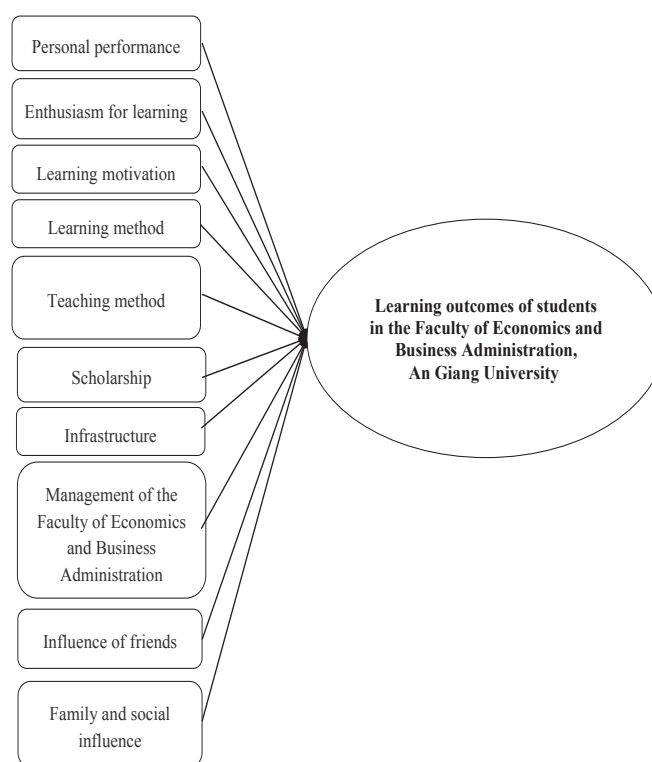


Fig. 1. Research model.

Table 2. Summary of theoretical results.

Numerical order	Factors	Authors
1	Personal performance	M.J. Kintu, et al. (2017) [15] N.S. Kirmani, et al. (2008) [16] M. Bratti, et al. (2013) [17] D. Checchi, et al. (2000) [18] M. Dickie (1999) [19]
2	Excited to learn	V.V. Viet, et al. (2017) [20]
3	Learning motivation	D.H. Hung, et al. (2020) [21] N.T.T. An, et al. (2016) [22]
4	Learning method	O. Usman, et al. (2022) [23], P.T.H. Thao, et al. (2020) [6]
5	Teaching method	P.T.H. Thao (2020) [6]
6	Infrastructure	P.T.H. Thao (2020) [6], V.V. Viet, et al. (2017) [20], M.J. Kintu, et al. (2017) [15]
7	Management of the Faculty of Economics - Business Administration	D.T.T. Huyen, et al. (2022) [24], N.S. Kirmani, et al. (2008) [16]
8	Influence of friends	O. Usman, et al. (2022) [23], V.V. Viet, et al. (2017) [20]
9	Family and social influence	O. Checchi, et al. (2000) [18] M. Dickie (1999) [19] V.V. Viet, et al. (2017) [20] O. Usman, et al. (2022) [23] N.H. Trang (2020) [25]
10	Scholarship	V.V. Viet, et al. (2017) [20]

Source: Authors' summary of research theory.

Research hypotheses:

Hypothesis H1: Personal performance has a positive linear relationship with student learning outcomes.

Hypothesis H2: Enthusiasm for learning has a positive linear relationship with student learning outcomes.

Hypothesis H3: Learning motivation has a positive linear relationship with student learning outcomes.

Hypothesis H4: The learning method has a positive linear relationship with student learning outcomes.

Hypothesis H5: The teaching method has a positive linear relationship with student learning outcomes.

Hypothesis H6: Scholarship has a positive linear relationship with student learning outcomes.

Hypothesis H7: Infrastructure has a positive linear relationship with student learning outcomes.

Hypothesis H8: Management of the Faculty of Economics and Business Administration has a positive linear relationship with student learning outcomes.

Hypothesis H9: Peer influence has a positive linear relationship with student learning outcomes.

Hypothesis H10: Family and societal influence have a positive linear relationship with student learning outcomes.

Based on the research review and theoretical framework on learning outcomes, the author summarizes the research scale in Table 3.

Table 3. Interpretation of observed variables in research models.

I. Personal performance (NLN)			
NLCN 1	Your personality affects the learning process	Likert 1 - 5	T.T.T. Huyen, et al. (2021) [26]
NLCN 2	The ability to study affects academic performance	Likert 1 - 5	
NLCN 3	Self-affirmation of individual abilities improves learning outcomes	Likert 1 - 5	
NLCN 4	Do time management skills affect academic performance?	Likert 1 - 5	
II. Enthusiasm for learning (HT)			
HT1	Prepare for the lesson before going to the lesson	Likert 1 - 5	L.D. Tho (2019) [27]
HT2	Are you doing your homework?	Likert 1 - 5	
HT3	Actively test your knowledge	Likert 1 - 5	
HT4	You plan your studies well (group study, self-study)	Likert 1 - 5	
III. Learning motivation (DC)			
DC1	Do you spend a lot of time studying?	Likert 1 - 5	P.T.H. Thao, et al. (2020) [6], D.T.K. Oanh (2013) [28]
DC2	Investing in your studies is your top priority	Likert 1 - 5	
DC3	You have a high sense of self-study	Likert 1 - 5	
DC4	His/her learning motivation is high	Likert 1 - 5	
DC5	You are always ready to overcome difficulties to achieve good academic results	Likert 1 - 5	
IV. Learning method (PP)			
PP1	Do you often set learning goals?	Likert 1 - 5	P.T.H. Thao, et al. (2020) [6], O. Usman, et al. (2022) [23]
PP2	Do you know how to execute your plan effectively?	Likert 1 - 5	
PP3	Reading the material under the guidance of the instructor	Likert 1 - 5	
PP4	Taking good notes in your own way	Likert 1 - 5	
PP5	Summarise the main ideas of the lesson	Likert 1 - 5	
V. Teaching method (GD)			
GD1	Lecturer combined with reading for students	Likert 1 - 5	P.T.H. Thao, et al. (2020) [6]
GD2	Instructor provides learning materials to students	Likert 1 - 5	
GD3	Instructors use the latest teaching techniques (kabuto, virtual classrooms, etc.).	Likert 1 - 5	
GD4	The instructor answers students' questions about the subject	Likert 1 - 5	
GD5	Instructors regularly check students' knowledge	Likert 1 - 5	
VI. Scholarship (HB)			
HB1	Are you interested in scholarships?	Likert 1 - 5	V.V. Viet, et al. (2017) [20]
HB2	You set high goals for scholarships in your studies	Likert 1 - 5	
HB3	Scholarships help you be more committed to your studies	Likert 1 - 5	
HB4	The value of the scholarship will help you continue your studies	Likert 1 - 5	
VII. Infrastructure (VC)			
VC1	Good quality classrooms (tables, chairs, projectors, computers)	Likert 1 - 5	P.T.H. Thao, et al. (2020) [6]
VC2	Extensive library resources (books, newspapers, e-books)	Likert 1 - 5	
VC3	The Internet is great for learning	Likert 1 - 5	
VC4	Good electricity and water system	Likert 1 - 5	
VC5	Good environmental hygiene (campus, restrooms, classrooms)	Likert 1 - 5	
VIII. Management of the Faculty of Economics and Business Administration (QL)			
QL1	Learning and career counselling activities of the Faculty meet the needs of students	Likert 1 - 5	N.S. Kirmani, et al. (2008) [16], D.T. T. Huyen, et al. (2022) [24]
QL2	Announcements from the Faculty are quickly disseminated to students	Likert 1 - 5	
QL3	Information about the training program is disseminated promptly	Likert 1 - 5	
QL4	Quickly respond to students' difficulties in learning problems (certificates of computer science, foreign languages)	Likert 1 - 5	
IX. Influence of friends (BB)			
BB1	Encouragement from friends to help you study well	Likert 1 - 5	O. Usman, et al. (2022) [23], T. T.T. Huyen, et al. (2021) [26]
BB2	Competition in the classroom helps you study well	Likert 1 - 5	
BB3	Working together to solve problems in the learning process makes your learning results good	Likert 1 - 5	
BB4	Many friends with the same learning goals help you learn better	Likert 1 - 5	
X. Family and societal influence (FS)			
FS1	Family support improves learning outcomes	Likert 1 - 5	N.H. Trang (2020) [25]
FS2	Family care enhances academic performance	Likert 1 - 5	
FS3	The family's income is guaranteed for studying, working, and improving learning outcomes	Likert 1 - 5	
FS4	Family is the driving force for you to strive for good learning outcomes	Likert 1 - 5	
FS5	Participating in social activities in the school improves learning outcomes	Likert 1 - 5	
XI. Learning outcomes (KQ)			
KQ1	Learning results reflect your learning ability	Likert 1 - 5	P.T.H. Thao, et al. (2020) [6]
KQ2	A good study result helps to accurately ascertain academic performance.	Likert 1 - 5	
KQ3	Better academic performance makes it easier to find a job after graduation	Likert 1 - 5	
KQ4	Academic achievement is proportional to professional ability at work	Likert 1 - 5	

Source: Summary of research theory.

4. Research methodology

This study employs a combination of both qualitative and quantitative research methods, outlined as follows:

Qualitative research: The author utilises in-depth interviews, featuring open-ended questions, to elucidate the factors influencing the learning outcomes of students in the Faculty of Economics and Business Administration. This phase involves the use of paper questionnaires and interviews with the subject matter experts, including lecturers with expertise in the research domain, as well as academic advisors (n=10). Data derived from the qualitative research phase will serve as the foundation for constructing a questionnaire for the subsequent quantitative research.

Quantitative research: The official questionnaire has been refined based on the insights gleaned from the qualitative research phase. The authors collect data by administering questionnaires to students (n=350) enrolled in various fields and courses within the Faculty of Economics and Business Administration. Following data collection, a thorough check is conducted to identify any inappropriate or incomplete surveys. Subsequently, all satisfactory surveys are subjected to analysis using the SPSS software system. The primary objective is to examine theoretical models and hypotheses. Various statistical, comparative, and analytical techniques are employed to facilitate the analysis of the research sample data.

5. Results and discussion

5.1. Sample statistics

The study surveyed 350 students from the Faculty of Economics and Business Administration at An Giang University, revealing that 58.6% of the respondents were female, while 41.4% were male. In terms of majors, Accounting constituted 21.4%, followed by Finance - Banking and Business Administration at 20.6%, International Economics at 20.9%, and Marketing at 15.7%. Concerning the academic year, the senior class comprised 143 survey participants, accounting for 40.9%, while juniors and sophomores had 64 participants, amounting to 18.3%, representing the lowest percentage. These percentages were based on a total of 350 observations.

The study also noted that 77 (22%) of the students received scholarships, while approximately one-third, or 273 (78%), did not receive scholarships. Furthermore, regarding part-time employment, 129 students (36.86%) held part-time jobs, which is less than half of the 221 students (63.14%) who did not have part-time jobs. Additionally, the number of hours students spent on part-time jobs ranged from 4 hours per week to 100 hours per week, with the highest percentage at 8 hours per week, involving 22 students, or 6.3%. Overall, however, the surveyed students dedicated a significant portion of their time to part-time employment.

Furthermore, the study indicated that the number of hours students devoted to self-study ranged from 0.2 hours per day to 10 hours per day. The highest proportion of students allocated 2 hours per day, comprising 102 students, or 29.1% of the total sample size of 350.

Moreover, the study encompasses students with varying learning outcomes, ranging from poor (less than 3.0) to excellent (9.0 to 10.0) academic performance. The highest percentage falls within the "good" category (7.0 to almost 8.0), with 159 students, representing 45.4% of the total 350 observations.

5.2. Reliability test results by Cronbach's alpha

The reliability test results, determined using Cronbach's alpha for variables influencing student learning outcomes such as Personal performance, Enthusiasm for learning, Learning motivation, Learning method, Teaching method, Scholarship, Infrastructure, Management of the Faculty of Economics and Business Administration, Influence of friends, Family and social influence, demonstrate high reliability. Moreover, the Cronbach alpha coefficients exhibit strong values, ranging from 0.684 to 0.919, surpassing the threshold of 0.6, indicating their reliability. The overall correlation coefficients for all variables exceed 0.3, affirming that these variables aptly elucidate the importance of the respective scales.

Additionally, the dependent variable Learning outcomes were tested using Cronbach's alpha, yielding a value of 0.777, surpassing the 0.6 threshold, with a minimum overall variable correlation of 0.576, indicating the suitability of this scale for factor analysis and regression.

5.3. Results of EFA

The initial study incorporated 45 observed variables categorised into 10 groups of factors influencing student learning outcomes, and these were subjected to EFA (exploratory factor analysis). The criteria for factor loadings included values >0.3 and eigenvalues >1 , with unsatisfactory observations being discarded. The 1st, 2nd, 3rd, and 4th EFA analyses yielded acceptable results for KMO, Bartlett, and Eigenvalues. However, there were still variables with weight differences <0.3 , necessitating their removal.

The fifth EFA analysis results indicate a KMO coefficient of 0.836, satisfying the condition $0.5 < \text{KMO} < 1$. This signifies that exploratory factor analysis is suitable for the actual data. Bartlett's test with $\text{Sig}=0.000 < 0.05$ demonstrates that the characteristic variables exhibit linear correlations with the representative factors. The total variance extracted amounts to 73.43%, signifying that 73.43% of the variance in factors is explained by the observed variables and coefficients. Moreover, the eigenvalue is 1.058, exceeding the threshold of 1, thus confirming the suitability of factor analysis in the final analysis.

Consequently, following exploratory factor analysis, five components have been extracted: Scholarship (HB), Teaching Method (GD), Family and Society (FS), Infrastructure (VC), and Motivation (DC) (Table 4).

Table 4. Rotated component Matrix^a

	Component				
	1	2	3	4	5
HB4	0.874				
HB3	0.863				
HB1	0.856				
HB2	0.855				
GD2		0.850			
GD1		0.784			
GD4		0.701			
FS2			0.805		
FS1			0.791		
FS3			0.605		
VC3				0.865	
VC1				0.837	
DC2					0.844
DC4					0.684

Source: Survey "Factors affecting students' learning outcomes at the Faculty of Economics and Business Administration, An Giang University" in 2023.

The results of the exploratory factor analysis (EFA) conducted on the dependent variable Learning outcomes (KQ) indicate that the KMO coefficient is 0.739, which satisfies the condition of $0.5 < \text{KMO} < 1$. Additionally, Bartlett's test with a significance level (Sig.) of 0.000, being less than 0.05 further affirms the suitability of the exploratory factor analysis for the actual data. These results suggest that the variables are linearly correlated with the factor being analysed. The total variance extracted is 60.35%, which is greater than 50%, showing that the change of factors is explained by the observed variables (Table 5).

Table 5. Component Matrix^a

	Component
	1
KQ1	0.789
KQ4	0.775
KQ2	0.774
KQ3	0.770

Source: Survey "Factors affecting the students' learning outcomes at Faculty of Economics and Business Administration, An Giang University" in 2023.

5.4. Regression analysis

The regression analysis model is constructed upon five independent variables derived from EFA (exploratory factor analysis), namely HB, GD, FS, VC, and DC. The authors calculate the mean value of these five factors and subsequently conduct a regression analysis.

In this section, the authors employ multiple linear regression to test the model, hypotheses and ascertain the correlation between factors and the learning outcomes of students in the Faculty of Economics and Business Administration at An Giang University.

Through the utilization of SPSS software, the results of the regression analysis are as follows:

The coefficient R^2 is often employed to evaluate the suitability of a multiple linear regression model (Table 6). A higher R^2 indicates a more fitting model. In the model summary, R^2 is obtained as 0.408, with an adjusted R^2 of 0.399, demonstrating the appropriateness of the factors incorporated in the model. The figure of 40.8% meets the standard for appropriateness (Table 6). ANOVA analysis reveals that the parameter F has $\text{Sig.}=0.000$, indicating that the constructed model aligns with the collected data, and the retained variables are

statistically significant at the 5% significance level. Consequently, the independent variables retained in the model are linked to the dependent variable, which is Learning Outcomes. In other words, the model elucidates 40.8% of the influence of these factors on the learning outcomes of students in the Faculty of Economics and Business Administration at An Giang University (Table 6).

Table 6. Model summary^a.

Model	R	R ²	Adjusted R ²	Std. error of the estimate	Change statistics					Durbin-watson
					R ² change	F change	df1	df2	Sig. F change	
1	0.639 ^a	0.408	0.399	0.3321	0.408	47.364	5	344	0.000	2.021
a. Predictors: (Constant), DC, VC, GD, HB, FS										
b. Dependent variable: KQ										

Source: Survey "Factors affecting students' learning outcomes at the Faculty of Economics and Business Administration, An Giang University" in 2023.

The results of the regression analysis indicate that all variables have coefficients with Sig. values <0.05, demonstrating their suitability for the authors' constructed model. However, the variable GD has a Sig. value of 0.256, which is greater than 0.05, suggesting that this variable does not significantly correlate with KQ. Consequently, the correlated variables have been retained in the regression model, and no issues related to multicollinearity were observed, as all variables in the model had VIF values below 2 (Table 7).

Table 7. Coefficients^a.

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	0.771	0.247		3.124	.002					
	HB	0.073	0.035	0.103	2.126	0.034	0.392	0.114	0.088	0.731	1.367
	GD	0.056	0.050	0.054	1.139	0.256	0.351	0.061	0.047	0.760	1.316
	FS	0.431	0.052	0.422	8.328	0.000	0.585	0.410	0.346	0.672	1.489
	VC	0.108	0.032	0.156	3.381	0.001	0.390	0.179	0.140	0.810	1.234
	DC	0.131	0.051	0.119	2.590	0.010	0.341	0.138	0.107	0.813	1.231
a. Dependent Variable: KQ											

Source: Survey "Factors affecting students' learning outcomes at the Faculty of Economics and Business Administration, An Giang University" in 2023.

The regression equation, incorporating the standardised Beta coefficients of the model developed by the authors, can be expressed as follows:

$$KQ = 0.422FS + 0.156VC + 0.119DC + 0.103HB + \varepsilon$$

where KQ: learning outcomes; FS: family and societal influence; VC: infrastructure; DC: learning motivation; HB: scholarship; ε : error term.

Based on the results of the regression analysis, it can be concluded that 40.8% of the variance in the dependent variable (economic output) is attributed to changes in the independent variables, while the remaining 59.2% can be attributed to other unaccounted factors outside the International Relations Influence Model for Students of the Faculty of Economics and Business Administration at An Giang University.

The most influential factor affecting the learning outcomes of students in the Faculty of Economics and Business Administration at An Giang University is family and social factors, as indicated by the beta coefficient of 0.422, which is the highest among all factors considered. Schools and families should take proactive measures to support students in achieving positive learning outcomes.

The second most influential factor is the quality of facilities, with a coefficient of 0.156, also showing a positive impact on KQ. Therefore, addressing infrastructure weaknesses should be a priority to enhance students' learning experiences.

The motivation of students to learn is the third significant factor affecting the academic

performance of students at An Giang College of Economics and Business, with a beta coefficient of 0.119. Schools should create conducive environments and foster student motivation to excel in their studies.

Lastly, scholarships have a positive effect on the academic performance of students at An Giang University's Faculty of Economics and Business Administration, as indicated by a beta coefficient of 0.103. This underscores the importance of offering scholarships to incentivise students to excel academically.

In summary, the impact of the independent variables on the dependent variable follows the order: FS (strongest), VC (second), DC (third), and HB (fourth).

5.5. Results of the analysis of the current state of factors affecting student learning outcomes

The research findings indicate that students in the Faculty of Economics and Business Administration generally exhibit an average level of agreement with component variables related to Family and Society, Scholarships, Infrastructure, Motivation, and Teaching. The mean values and corresponding levels of consent are presented in Table 8.

Table 8. Mean values of factors.

Factors	Mean	Level of consent
Family and society	4.110	Agree
FS1	4.014	Agree
FS2	4.163	Agree
FS3	4.154	Agree
Scholarship	3.878	Agree
HB1	3.840	Agree
HB2	3.794	Agree
HB3	3.943	Agree
HB4	3.934	Agree
Infrastructure	3.733	Agree
VC1	3.789	Agree
VC3	3.677	Agree
Motivation	4.142	Agree
DC2	4.177	Agree
DC4	4.106	Agree

Source: Survey "Factors affecting the students' learning outcomes at the Faculty of Economics and Business Administration, An Giang University" in 2023.

The analysis reveals that three groups fall within the "agree" category, with mean factor scores ranging between 3.41 and 4.2 (Table 8):

Family and social factors, which exert a strong influence on a student's learning outcomes, although with a medium score lower than that of motivation. Factor FS2 (family care improves learning outcomes) has the highest mean value, indicating that family's attention plays a significant role in influencing student learning outcomes.

The scholarship group, with four evaluation factors. Among these, HB3 (Scholarships help you be more committed to your studies) has the highest average score of 3.943 points, indicating a growing interest in student scholarships.

For the Athletic Performance group, where the highest-rated factor is DC2 (Investing in your studies is your top priority), with an average score of 4.177. This underscores the importance of prioritizing learning compared to other activities.

In the Facility group, VC1 (Good Classroom Quality) has the highest average score at 3.789, highlighting the importance of quality classrooms in the learning process.

6. Conclusions and suggestions

In conclusion, learning outcomes are significantly influenced by various factors. The evaluation results for the Scale of Factors Influencing Learning Outcomes are reliable, meeting the criteria (Cronbach's alpha >0.6 and overall correlation >0.3). Factor analysis through EFA extracted five influential groups: family, society, facilities, motivation, scholarship, and teaching methods.

Regression analysis identifies four key groups of factors that influence learning outcomes: family and society, academics, institutions, and motivation. Family and social factors, in particular, exert a substantial impact on learning outcomes. To enhance student learning outcomes, it is advisable to consider family and social factors in the educational approach.

6.1. Proposals to improve student learning outcomes with family and social factors

Families should actively provide support and assistance to students facing academic challenges. When students experience high academic pressure, families play a crucial role in sharing and encouraging students to alleviate this pressure. Additionally, family guidance can offer students insights into their future career paths, aiding them in acquiring relevant

knowledge that will support their future work. To further support students, families can help alleviate the financial burden associated with coursework and the procurement of related learning materials. Schools should also explore opportunities for diversification and collaboration with local and regional businesses, providing Economics and Business students with exposure to the business environment. This approach ensures that students are well-informed about the learning process, ultimately leading to improved learning outcomes.

6.2. Proposals to improve student learning outcomes with infrastructure elements

While the school provides internet access throughout the campus, it is important to address the issue of weak and unreliable network connections. Schools should consider upgrading their network systems with more robust transmission lines to facilitate activities that require reliable internet connectivity during the learning process. Additionally, schools must prioritise regular maintenance and inspections to ensure prompt repairs without disrupting students' learning experiences.

6.3. Proposals to improve student learning outcomes with motivational elements

To boost student motivation, schools can establish partnerships with companies, organise seminars and information sessions, offer career opportunities to Economics and Business students, and arrange visits to corporate departments. Career-sharing sessions inject enthusiasm and provide students with a deeper understanding of potential career paths after graduation. This increased awareness can serve as a motivating factor, driving students to excel in their studies as they accumulate knowledge for their future careers. Within the classroom, motivational strategies such as awarding points, fostering debates, and encouraging students to voice their opinions with teachers and peers can further enhance engagement and participation. Recognizing and rewarding academic excellence with scholarships can also significantly increase students' interest and concentration in their studies.

6.4. Proposals for improving student learning outcomes through scholarship programs

Schools should consider diversifying their scholarship offerings based on student academic performance. Scholarships or grants aimed at improving English

language skills can be awarded to students who excel in English exams. Additionally, schools can promote scientific research among students, fostering a culture of learning and knowledge application. This approach encourages students to strive for academic excellence and continuous improvement in their academic performance.

6.5. Research limitations and future work

This study primarily focused on identifying the factors influencing the academic performance of students within the Faculty of Economics and Business Administration, leading to a narrow microanalysis within its scope. Future research endeavours may involve conducting more extensive studies encompassing students from all eight faculties at An Giang University. This broader approach would allow for comparisons of learning outcomes among various faculties, providing valuable insights into academic performance across different academic disciplines.

CRediT author statement

Tran Minh Hieu: Editing, Methodology, Designing research scales, Drafting the results section of the manuscript; Nguyen Thanh Vinh, Le Thi Ngoc Chuc, Nguyen Ngoc Thao Ngan, Phan Thanh Loc: Reviewing, Data collection, Analysing, Writing.

COMPETING INTERESTS

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

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ASEAN's soft law on marine environmental pollution

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Abstract:

The sea-bound development of humankind is the most pronounced and significant feature of the 21st century, which is expected to be the ocean's century. The United Nations' Sustainable Development Goals (SDGs) recognise the conservation and sustainable use of seas and oceans as an indicator of a country's development level. Humankind faces grave challenges associated with marine environmental pollution due to the accelerated pace of maritime resource extraction. Owing to the uniformity and the transboundary nature of the marine environment, preventing and reducing marine environmental pollution is not only a national concern but also a regional and global priority. As a region with diverse ecosystems and abundant marine resources, The Association of Southeast Asian Nations (ASEAN) has long viewed marine environmental preservation as a cornerstone of its environmental protection strategy. This paper posits the effectiveness of ASEAN's "soft law" and discusses member states' cooperation through the establishment of regional documents and mechanisms to address environmental pollution. On that foundation, the study underscores the role of ASEAN's "soft law" and projects its trajectory concerning the regional legal framework for protecting the marine environment.

Keywords: ASEAN, marine environment, marine environmental pollution, regional cooperation, soft law.

Classification number: 6

1. Introduction

In December 2017, the United Nations General Assembly (UNGA) approved the Decade of Ocean Science for Sustainable Development (2021-2030). There are two Ocean Decade Outcomes describing "The Ocean We Want" that member states aspire to achieve: (i) A clean ocean where sources of pollution are identified and reduced or removed. (ii) A healthy and resilient ocean where marine ecosystems are understood, protected, restored, and managed.

Marine pollution is mentioned as the foremost challenge to be addressed in the Ocean Decade strategy. The degradation of marine ecosystems, stemming from pollutants and contaminants, is accelerating due to unsustainable activities on land and at sea [1]. Nowadays, safeguarding the marine environment has become a prevalent human concern. In an increasingly intricate world where many relationships extend beyond national

boundaries, states have adopted a series of soft law instruments to manage regional marine environmental issues [2].

Southeast Asia boasts a strategic location and an extensive coastline, courtesy of its borders with the Pacific and Indian Oceans. As a result, environmental pollution prevention, ecosystem preservation, and resource safeguarding are perpetual matters of concern. The coastal regions of Southeast Asia account for approximately 34% and between one-quarter to one-third of the world's coral reefs and mangrove forests, respectively [3]. The biodiversity centre - the triangle connecting the Malay Peninsula, the Philippines, and New Guinea - is the most significant marine diversity area. It is home to around 500 types of corals (approximately 75% of coral species known to humans) and 3,000 types of coral reef fish (nearly 40% of fish species known to humans) [4]. However, over 80% of the coral reefs are on the brink of extinction due to various sources of marine pollution [5].

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The organisation of ASEAN that utilises “soft law” reflects an aspect of the law governing the protection of the marine environment. Although no centralised regional legally binding framework exists, ASEAN nations persist in collaborating and striving to promote “soft law” that would address the region's issues with maritime environmental contamination.

Research purpose: a common interest among ASEAN member states is rooted in the fact that the region is blessed with abundant and diverse natural resources. Consequently, various challenges have emerged surrounding environmental conservation and sustainable development. This article delves into the use of soft law in addressing marine pollution in ASEAN. It charts the evolution and role of soft law in regulating environmental pollution, especially in the absence of specialised agencies and legal frameworks. This assessment examines the effectiveness and forecasts the trajectory of ASEAN soft law in tackling the challenges posed by marine pollution.

2. Results

2.1. Overview

While the International Convention for the Prevention of Pollution of the Sea by Oil symbolised the international community's inaugural effort to grapple with this issue, it did not provide a clear definition of “marine pollution.” As per the Joint Group of Experts on Scientific Aspects of Marine Pollution - GESAMP, marine pollution is defined as the “introduction by man of substances into the marine environment resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing, impairment of the quality of use of seawater and reduction of amenities” [6]. This definition was subsequently incorporated into Article 1(4) of the United Nations Convention on the Law of the Sea 1982 (UNCLOS 1982). Notably, Article 1(4) includes preventive measures as it oversees activities that could potentially lead to pollution.

The UNCLOS 1982 categorises marine pollution based on its varied sources: pollution from land-based sources, pollution from seabed activities subject to national jurisdiction, pollution from

activities in the Area, pollution from dumping, pollution from vessels, and pollution from or through the atmosphere. Land-based pollution and air pollution are estimated to account for roughly 80 percent of marine pollution [7]. The challenge is that land-based pollution remains a relatively recent phenomenon in the law of the sea, evidenced by the constraints of the global legal framework governing this issue. As of now, the UNCLOS 1982 is the sole treaty stipulating obligations to combat global-scale land-based marine pollution.

According to The United Nations Environment Programme (UNEP), the world produces approximately 400 million tonnes of plastic waste every day. It's projected that between 75 to 199 million tonnes of plastic currently reside in our oceans. A 2008 study found more than 400 “dead zones” - areas where aquatic life can no longer thrive - exist worldwide. This dire situation necessitates an encompassing global legal framework, predominantly composed, at present, of soft laws [8].

2.2. Soft law

There has not been an official definition of “soft law”, and it is ambiguous to determine whether an international agreement, which is not a treaty, constitutes soft law. M.N. Shaw (2017) [9] identifies soft law as particular non-binding instruments or non-binding provisions in treaties. This definition is broad as it only distinguishes soft law from treaties and assumes that, in some circumstances, soft law can be incorporated into treaties as provisions that create no obligation. Shaw emphasises the importance of soft law in the development trend of international law and countries' political will. However, treaties also contribute to the development tendency of the law and reflect nations' will collectively. Shaw also suggests that “soft law” can ultimately be converted into legally binding rules via a transformation into a binding treaty or acceptance as a customary rule.

A.T. Guzman, et al. (2010) [7] argued that soft law is simply not law. They highlight the quasi-legal characteristic of soft law, which is not illegal but is obligatory to a country only if they accept it voluntarily. In other words, soft laws are hortatory rather than legally binding [10].

The term “soft law” is both vague and contradictory. While the law is traditionally seen as “hard” due to its obligatory nature, soft law is not legally binding, making it challenging to determine whether it still qualifies as “law”. Furthermore, not every non-binding agreement is categorised as soft law. It is prudent to define soft law in broad terms, describing it as international agreements made by two or more countries or an international organisation that are hortatory and non-binding.

Prime examples of soft law include resolutions, guidelines, recommendations, or codes issued by international organisations. Some areas of international law generate more soft law than others; notably, international economics law and international environmental law stand out [9].

Soft law is gaining increasing traction in the international community due to its flexible features, which will be discussed in subsequent sections. The primary rationale is that, in many scenarios, it may be beneficial for states to enter agreements that are not legally binding and subjected to formal legal implementation. However, these agreements still convey a political intention to act in a specified manner and record states' intended courses of action on mutual concerns. Such agreements might be more flexible, simpler to establish, and easier to adhere to [9]. In practice, this approach has been acknowledged as an international custom [10]. Additionally, the evolution of soft law mechanisms also encourages the direct and influential participation of non-state entities such as non-governmental organisations, a presence less common in treaty negotiations.

2.3. Soft law on marine pollution: features and roles

Environmental soft law has progressively become more popular as environmental issues have emerged as alarming global problems. The growth of soft law norms regarding environmental protection commenced immediately after the Stockholm Conference, which led to the foundation of UNEP. This stems from the existence and development of a network of permanent international and regional institutions as well as the swift progression of international practice. Soft laws on marine pollution possess several noteworthy features:

As previously mentioned, soft law on marine pollution is hortatory, meaning it creates and outlines goals to be achieved rather than actual duties; it suggests programmes rather than prescriptions, and guidelines rather than strict obligations [11]. As a result, soft law is often found in “soft” instruments, namely recommendations or resolutions of international organisations, declarations or acts concluded after international conferences, and even proposals drafted by groups of highly qualified experts. Notably, there are a number of treaty provisions whose wording is so “soft” that they seem impossible to regard as obligatory for member states [12].

Furthermore, the paramount feature of soft law on marine pollution is its voluntary nature, with no sanctions in the event of non-compliance. This contrasts with treaties, which, while also voluntary by nature, require states to adhere to specific procedures and face potential sanctions. Nevertheless, states are encouraged to respect soft law as soft norms can help define the standards of “good behaviour” expected of a “well-governed government” [11]. In essence, it signifies a state's responsibility in the realm of international cooperation, especially on pressing issues like marine pollution. Voluntarily following soft law elevates a state's prestige within the global community.

Examining the roles of soft law in addressing marine pollution, environmental soft law evolves under the guidance of international environmental regimes, and in turn, it enhances the effectiveness of these organisations in mitigating global-scale marine pollution. Agenda 21, presented by the United Nations (UN) in 1992, called upon UNEP to convene intergovernmental meetings on marine pollution. This call was heeded with the adoption of the 1995 Washington Declaration and the 1995 Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA). Building upon the 1985 Montreal Guideline for the Protection of the Marine Environment against Pollution from Land-based Sources, UNEP has offered guidelines for states to draft national action programmes that protect seas and coasts from land-sourced activities. In the Agenda 2030 for Sustainable Development, the UN integrated oceanic sustainable development as the 14th goal. As a result, numerous countries have made international commitments to combat marine

pollution [13]. According to a 2016 survey, based on the network of national action plans and the integration of GPA's goals into national strategies, 107 countries have established policies to address this urgent concern, and 94% of countries have prioritised and highlighted marine pollution prevention in their national zoning plans. The Global Environment Facility (GEF) has financed over 750 projects with a total of 2,974 million USD, aiming to heighten countries' awareness of international oceanic cooperation and offer a holistic approach for government agencies in tackling marine pollution.

3. ASEAN' soft law on marine environmental pollution

3.1. Features of ASEAN's soft law on marine pollution

ASEAN soft law on marine environmental protection is a type of international agreement that is not legally binding. It is crafted by countries or regional organisations that voluntarily agree to implement its provisions. The primary characteristics of ASEAN soft law on marine environmental protection are as follows:

Formation: ASEAN soft law is forged through a process of negotiation and agreement between the parties involved. It is not subject to the same legal requirements as a binding international treaty, such as ratification by national governments.

Essence: ASEAN soft law operates on the principle of voluntariness. Countries and organisations that consent to enact its provisions are not legally compelled to do so. However, they might confront political or economic pressure to adhere to the agreement.

Subjects: The entities of ASEAN soft law on marine environmental protection are countries or regional organisations. These can be bilateral or multilateral agreements. The parties to the agreement are not representing their governments but act as individuals or entities authorised to negotiate and execute the agreement.

Content: ASEAN soft law on marine environmental protection embodies commitments to shield the marine environment in the region. These pledges may encompass specific actions that countries or organisations agree upon, or they might be broader statements of intent.

Form: ASEAN soft law on marine environmental protection is commonly drafted in the format of a protocol, resolution, declaration, or agenda. It might also be encompassed in a more extensive document, such as a development strategy or environmental plan

Regarding the ratification procedure: International treaties must undergo a specific process at the national level for ratification. Conversely, many countries opt to affirm their membership in these treaties through domestic procedures. Soft law, however, is frequently endorsed via a more straightforward process. Occasionally, the sole requisite for adoption is an address by a national representative vowing to implement its content. Countries often favour the application of soft law agreements as they present a more flexible and less legally binding alternative to international treaties. Furthermore, soft law agreements can typically be endorsed more swiftly and effortlessly, proving advantageous for nations desiring to showcase their allegiance to international cooperation. The adoption of soft law agreements also aids countries in enhancing their image as responsible and esteemed members of the international community. By showcasing their eagerness to collaborate on pivotal matters, countries can secure the trust and regard of other nations, potentially benefiting their economic and political standing.

3.2. The formation of ASEAN's environmental protection programs

ASEAN is a diverse region with pronounced differences in geography, economy, and politics. Nevertheless, mutual interests and shared concerns have unified this disparate group. With its diverse ecosystems and rich natural resources, ASEAN consistently prioritises environmental protection, especially that of the marine environment. The bloc is inclined towards the sustainable use and management of resources to achieve enduring and stable objectives. To date, ASEAN has not had a specific agency dedicated to marine environmental pollution protection. In spite of these limitations, cooperation mechanisms for maritime environment protection in the region continue to flourish, as evidenced by the formulation and evolution of ASEAN soft law documents.

ASEAN has acknowledged the significance of environmental cooperation for sustainable

development and regional integration. Since 1977, ASEAN has actively championed environmental cooperation among its member states. This collaboration has broadened over the years, both in terms of the number of nations participating and the range of issues tackled. Presently, ASEAN's environmental cooperation is steered by the ASEAN Socio-Cultural Community (ASCC Blueprint) 2025, which envisages an ASEAN Community that is inclusive, sustainable, resilient, and dynamic.

In discussing the initiation of environmental protection collaboration within the region, one must reference the ASEAN Sub-Regional Environment Programme I (ASEP 1), conducted under the aegis of UNEP. As ASEAN soft law has evolved, regional documents on marine environmental protection have been crafted and issued, founded upon universally acknowledged principles present in international treaties. Notably among these is the UNCLOS 1982.

3.3. Current mechanisms and documents

In spite of the lack of binding agreements or protocols concerning marine environmental pollution in the Southeast Asia region, coastal states and regional organisations have set up various regional initiatives, agencies, and working groups that focus on specific marine environmental issues:

ASEAN has several initiatives concerning marine environmental protection. These include the ASEAN Agreement on the Conservation of Nature and Natural Resources, the ASEAN Agreement on the Management of Vessel-Source Pollution, and the ASEAN Regional Action Plan for Marine Debris.

UNEP manages multiple programmes and projects centred on marine environmental protection in the Eastern Sea (Bien Dong). Notable among these are the Regional Seas Programme, the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, and the Coral Reef Degradation in the Wider Caribbean and Eastern Sea project.

The China-ASEAN Environmental Cooperation Fund has backed several projects relating to marine environmental protection in the Eastern Sea. These initiatives encompass the creation of marine protected areas, the establishment of marine pollution monitoring networks, and training for marine environmental professionals.

These regional endeavours have been instrumental in increasing awareness of marine environmental challenges, developing and implementing policies and regulations, and enhancing capability for marine environmental management in the Southeast Asia region. Moreover, they have played a crucial role in cultivating cooperation and coordination among coastal states and regional organisations, both of which are vital for safeguarding the marine environment in this pivotal region.

ASEAN Bodies: Within ASEAN, several bodies and working groups participate in cooperation concerning the regulation of marine environmental pollution and protection. ASEAN comprises 10 member states (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam) and is structured under three pillars, with bodies dedicated to marine environmental issues present within all three. The most significant of these is the ASEAN Working Group on the Coastal and Marine Environment (AWGCME). The AWGCME adheres to the Blueprint for the ASCC Blueprint 2025, which outlines commitments to ensure that ASEAN's coastal and marine environments are sustainably managed. This includes the protection of representative ecosystems, pristine areas, species, and ensuring that economic activities are sustainably overseen, whilst also fostering public awareness of these coastal and marine environments [14]. ASEAN also maintains substantial cooperative ties with other states in the region, such as through ASEAN-China and the East Asia Summit, as well as broader engagements like the ASEAN Regional Forum.

The Partnerships in Environmental Management for the Seas of East Asia (PEMSEA): PEMSEA is an intergovernmental organisation functioning in East Asia with the aim to nurture and sustain healthy and resilient oceans, coasts, communities, and economies across the region. It partners with eleven countries: Cambodia, P.R. China, Indonesia, Japan, DPR Korea, Laos, Philippines, Republic of Korea, Singapore, Timor-Leste, and Vietnam, three of which are not members of the Coordinating Body for the Seas of East Asia (COBSEA). Even though it excludes three Eastern Sea and Gulf of Thailand coastal states, these states have nonetheless adopted the non-binding SDS-SEA regional marine strategy. PEMSEA operates via four main mechanisms: the East

Asian Seas Congress, the EAS Partnership Council, and the PEMSEA Resource Facility. In its journey, PEMSEA has made notable strides in integrated coastal management (ICM) and has endorsed non-binding instruments, such as the Joint Statement on Partnership in Oil Spill Preparedness and Response in the Gulf of Thailand (GOT Programme) which was signed by Cambodia, Thailand, and Vietnam in 2006 [15]. The organisation receives sponsorship from the United Nations Development Programme (UNDP) and GEF.

Currently, PEMSEA is the most viable contender for regional institutional building. It has solidified commitments through documents like the Sustainable Development Strategy for the East Asian Seas (SDS-SEA), the Haikou Agreement, and the Declaration of Malina. Administrative entities such as the East Asian Seas Conference (EASC) and the East Asian Seas Partnership Council (EAS-PC) have been instituted to make decisions and supervise the progression. Even though a regional institution seems to be materialising, it remains nascent, and the commitments thus far are primarily geared towards integrated coastal zone management (ICZM).

Of late, PEMSEA has persistently pursued sustainable development in the region, broadening its remit to address other marine and coastal concerns like marine pollution and climate change. New tools and resources have been introduced to aid countries in the region with SDS-SEA implementation. Notably, PEMSEA has crafted a Coastal Management Toolkit and a Marine Litter Action Guide. Concurrently, the UNDP has endeavoured to amplify the execution of the Sustainable Development Strategy for the Seas of East Asia, invigorating multistate collaboration to restore marine fisheries and diminish the pollution affecting coasts and Large Marine Ecosystems [16].

COBSEA: In 1981, the Action Plan for the Development of the Marine Environment and Coastal Areas of the East Asian Seas Region (East Asian Seas Action Plan) was adopted [17]. This culminated in the formation of COBSEA in 1983. COBSEA is a non-binding, voluntary organisation that encourages compliance with existing environmental treaties [18]. It currently boasts 9 members, encompassing all Eastern Sea and Gulf of Thailand coastal states original members are Indonesia, Malaysia, Philippines, Singapore, and

Thailand. It was expanded in 1994 and now also includes Cambodia, P.R. China, The Republic of Korea, and Vietnam... COBSEA's current remit is to steer member countries towards the enhancement and conservation of the marine environment and coastal areas of the East Asian Seas [19]. The 2018-2022 Strategic Directions of COBSEA accentuate land-based and marine pollution, marine and coastal planning and management, and governance. COBSEA operates under the aegis of UNEP.

COBSEA, leading the UNEP Regional Seas Programme in the East Asian Seas, was founded on the principles of the East Asian Seas Action Plan. Not being a legally binding agreement, COBSEA has functioned within the realm of soft law for over three decades. Consequently, member states might encounter difficulties negotiating a fresh regional agreement on marine environment protection, with current political will not yet veering towards such a convention. Nevertheless, this does not preclude the potential for brokering and enacting specific regional conventions dedicated to marine environmental safeguarding. The continuous endeavours to synchronise regional practices could be viewed as a consensus-driven procedure that may usher in formal multilateral legislation in the future.

Assessing whether the Action Plan concerning environmental conservation and sustainable progression of the sea and coastal zones of East Asian seas translates into a genuine commitment is intricate. Upon delving into the document, it suggests that such pledges might hold more weight than the proposed actions of the East Sea Project or the confidence-building measures within the Eastern Sea Conference framework, yet possibly not as stringent as the stipulations of the Declaration on Conduct of the Parties in the Eastern Sea (DOC). However, numerous objectives delineated in the Action Plan remain too broad to guarantee robust enactment, such as the envisaged construction of a marine protected area system or amplifying environmental impact assessment proficiency in the region [17]. Similarly, two subsequent documents tackling pollution from land sources and marine debris, comparable to the East Sea Project, merely suggest upcoming endeavours without laying down obligatory protocols for the stakeholders.

It's pivotal to acknowledge that the Action Plan resides within a more expansive framework of regional seas programmes and accords. These initiatives aspire to carve out comprehensive strategies and structures for environmental protection while championing sustainable development in designated regions [20]. A subset of these programmes have ratified legally-binding conventions and protocols, manifesting the resolution of nations to collaboratively address shared environmental dilemmas. Nonetheless, the degree of binding commitment fluctuates amongst these various programmes and treaties.

The ASEAN Strategic Plan on Environment (ASPEN): ASPEN 2016-2025 is a comprehensive guide for ASEAN cooperation on the environment from 2016 to 2025. The plan is comprised of seven agreed strategic priorities, each with its own corresponding action plan. These priorities encompass:

- Enhancing environmental governance: This priority aims to fortify ASEAN's environmental governance framework and institutions. Actions include formulating a regional environmental law, bolstering the capability of national environmental agencies, and advocating for public participation in environmental decision-making.

- Managing natural resources sustainably: This priority aspires to guarantee the sustainable utilisation of natural resources within ASEAN. It incorporates actions like crafting a regional biodiversity strategy, endorsing sustainable forestry practices, and curtailing pollution from agricultural pursuits.

Addressing climate change: This priority targets both mitigation of and adaptation to climate change within ASEAN. Activities comprise formulating a regional climate change strategy, championing renewable energy, and diminishing greenhouse gas emissions.

Protecting the environment from pollution: This priority seeks to curtail pollution within ASEAN. Actions include developing a regional pollution control strategy, advocating cleaner production techniques, and minimising waste production.

Promoting environmental education and awareness: This priority endeavours to heighten environmental issue awareness in ASEAN. Actions span from creating environmental education resources and orchestrating environmental

consciousness campaigns to endorsing environmental tourism.

Strengthening regional cooperation on environment: This priority is centred on enhancing cooperation on environmental matters amongst ASEAN Member States. Activities encompass formulating regional environmental accords, disseminating information and best practices, and synchronising regional environmental action plans.

The ASPEN derives its foundation from the ASEAN Community Vision 2025, which demarcates ASEAN's aspirations for the upcoming decade. The plan also considers the burgeoning needs of ASEAN Member States and the pledges made by ASEAN to address pertinent topics on the global agenda.

The ASPEN presents a crucial blueprint for steering ASEAN cooperation on environmental matters in the ensuing years. It delineates a lucid action framework and a trajectory for realising the ambitions set out in the ASEAN Community Vision 2025.

Beyond the seven strategic priorities, the ASPEN introduces several cross-cutting themes, such as gender, youth, and disaster risk reduction. These themes hold significance in ensuring the inclusivity of the ASPEN and in catering to the requirements of all ASEAN inhabitants.

The ASPEN stands as a dynamic document, subject to updates as necessary. It remains an invaluable asset for ASEAN Member States, civil society organisations, and other stakeholders committed to preserving the environment in ASEAN.

3.4. Assessment of the mechanisms

The ASEAN's soft law mechanisms regulating marine environmental pollution and protection have achieved certain results in addressing marine environmental issues in Southeast Asia. ASEAN's soft law instruments have helped to raise awareness of the problem of marine environmental pollution and have led to some improvements in national legislation and enforcement.

Despite the successes, many limitations of cooperation in regulating marine environmental pollution in ASEAN remain.

Firstly, lack of compliance: Soft law regimes are often voluntary and non-binding, which can make it difficult to ensure compliance. Although ASEAN member states have had certain common

perceptions regarding marine environmental protection cooperation, the region has not yet reached legally binding commitments. The ASEAN seawater quality standards have been issued, but the solution is still to encourage member states to move towards this standard. The ASEAN mechanism to strengthen supervision against illegal discharge and discharge of sludge from oil tankers at sea was promulgated in 2009. However, in practice, implementation depends on the consciousness of ship owners because of the lack of mechanisms and capacity to monitor and check. The initiatives that are currently being appreciated are PEMSEA and CTI, which still lack specific regulatory mechanisms.

Secondly, ASEAN lacks a dedicated environmental organization: The environmental protection functions are spread across various ASEAN institutions. This decentralisation may hinder effective cooperation among ASEAN member states in environmental protection. While ASEAN's current system allows for the development of a neutral regional policy, it also means that environmental protection is only a "part-time" responsibility for all bodies involved. This duality prevents representatives from focusing entirely on ASEAN's environmental performance.

There is a willingness among ASEAN member states to cooperate on regulating marine environmental pollution and protection, at least in terms of creating an institutional framework. Although there is no legally binding instrument, states are establishing bodies to cooperate on marine environmental protection. Furthermore, Southeast Asia is a region with a diverse range of development levels and legal cultures. ASEAN is the primary cooperative mechanism, but not all Southeast Asian states are members. The most notable non-member is China, which borders the Eastern Sea and is thus also obligated under Article 123 UNCLOS 1982 to coordinate the implementation of their rights and duties with respect to the protection and preservation of the marine environment with other Eastern Sea littoral states (which are all ASEAN member states).

Thirdly, limited capacity for monitoring and control: Soft law regimes are often difficult to enforce, as there is no supranational authority with the power to do so. Hence, cooperation in regulating marine environmental pollution and protection in Southeast Asia faces many challenges due to the limited

capacity for monitoring and control of countries in the region.

Although hard law binding obligations are the norm in most regions, it's not a mandatory requirement for cooperation. ASEAN member states prefer soft law arrangements, which are also common in other regions where binding agreements exist, but cooperation is still lacking. In ASEAN, several bodies are engaged in marine environmental protection, indicating political will for cooperation. The lack of a binding agreement does not impede effective cooperation in the region. A deeper commitment to the coordination and implementation of international obligations can foster soft commitments and accountability among states. In the future, hard law can emerge without affecting existing soft law arrangements.

ASEAN's soft law regimes regulating marine environmental pollution can play a vital role in protecting the marine environment. They can provide a framework for cooperation and coordination among states, and they can raise awareness of marine environmental issues. Moreover, soft law regimes can be used to build trust and goodwill among states, which can facilitate the negotiation and implementation of hard law agreements in the future.

3.5. Assessments of ASEAN's soft law's developing trend

Despite the advantages and relevance of regulating regional marine pollution, there remain limitations in the region's environmental management mechanism that the development of ASEAN soft law has, temporarily, failed to address:

(i) The consistently expanding environmental cooperation has not been pushed to its fullest potential, evidenced by the bloc's absence of an organisation dedicated solely to environmental issues. This leads to a significant "void" in the management and promotion of the implementation of regional commitments and agreements on marine environmental protection. The function of protecting the environment, including the marine environment, is "scattered" across different institutions of the Association or concurrently performed by member States. This decentralisation of functions reduces the effectiveness of ASEAN cooperation, given that such division does not allow for an undivided focus on ASEAN's environmental performance.

(ii) While the absence of a robust legal framework contributes to the growth and proliferation of ASEAN soft law, it simultaneously complicates the implementation of common environmental policies. Essentially, this weak legal foundation prevents environmental policies from evolving beyond their declaratory and recommendatory nature, creating challenges in the enforcement process. This represents the most significant challenge when applying soft law in regulating marine pollution in the region.

The authors argue that the usage of soft law in ASEAN to regulate marine environmental pollution has been growing for three main reasons:

First, the UN has become more intricate and specialised over recent decades. The UN now houses numerous standing agencies that offer guidance on economic, political, and social matters. These agencies have championed the use of soft law by creating forums for discourse and negotiation among nations.

Second, global society has diversified since the late 1950s. The number of less developed countries (LDCs) has risen, and these nations frequently have differing interests and priorities than their developed counterparts. Soft law offers a flexible structure for cooperation that can accommodate the interests of LDCs.

Third, the world's economy has become markedly interconnected in recent years. Such interdependence presents fresh challenges for environmental protection, including the cross-border migration of pollutants. Soft law can address these issues by establishing a cooperative framework among countries.

The authors conclude that soft law is an invaluable instrument for ASEAN in its efforts to regulate marine environmental pollution. Soft law's adaptability means it can be tailored to the region's unique requirements. Moreover, it provides a relatively expedient and straightforward method for achieving consensus among nations.

Beyond the three reasons outlined by the authors, several other factors have spurred the growth of soft law within ASEAN. For instance, soft law can address subjects not yet ready for binding international

agreements and foster collaboration between countries at different stages of development or with disparate legal systems.

4. Conclusions

Protecting the marine environment is an urgent task. All countries recognise the significance of cooperation in preserving the marine environment. However, due to varied historical, political, economic, technical, and cultural attributes, distinct models have emerged in different regions of the world.

One effective model is the development of regional conventions on the marine environment protection. For instance, the PEMSEA mechanism in East Asia has garnered participation from governments, organisations, businesses, investors, individuals, and partners to collaboratively manage East Asia's coastal regions and seas. Yet, this remains a soft model, not legally binding, and its depth of efficacy is limited.

Environmental concerns have been a focal point for ASEAN from its inception. Nonetheless, ASEAN's environmental management mechanism and its legal basis for execution remain insufficient. To foster cooperation in environmental matters, ASEAN should prioritise the following areas in the near future:

Establishment of a specialized agency in the field of the marine environment: As ASEAN cooperation expands, there is a pressing need for a specialised agency responsible for coordinating, administering, inspecting, and overseeing the execution of the Association's environmental policies, inclusive of the marine environment.

Completion and synchronization of the ASEAN legal framework in environmental protection: The "ASEAN Way" - a consensus mechanism in the Association's decision-making, while ensuring equitable interest for all member states, occasionally hinders the formulation of ASEAN's legal documents. Moving forward, the Association must take innovative steps and employ flexibility in crafting environmental treaties, especially those concerning the marine environment and climate change. To align with international environmental conventions and facilitate the development of novel agreements, like the recent global accord on plastic pollution, ASEAN should proactively contribute to these initiatives.

Regional cooperation to deal with the risk of transboundary marine pollution, rising sea levels, climate change, biodiversity loss, and the construction of nuclear power plants: Countries in the region must intensify their collaborative efforts to address the risks associated with transboundary marine pollution, escalating sea levels, climate change, biodiversity decline, and the establishment of nuclear power plants. ASEAN nations must devise strategies to enhance the efficacy of cooperation in these crucial areas.

Soft law is poised to evolve further, concurrently with the advancement of legal mechanisms. The crux lies in the consensus and voluntary commitment of countries—regardless of whether it's soft law or formal legal mechanisms that dictate effectiveness. From a research standpoint, the drive is still towards more established mechanisms. However, the appeal of soft law remains in its diversity and adaptability.

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COMPETING INTERESTS

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

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Sustainable tourism development and potential implications for the tourism sector in the Vietnamese Mekong delta in the context of climate change

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Abstract:

Mekong delta is one of the most vulnerable delta in the world to climate change. Tourism is the rising economic sector in the region and is expected as one of the sectors to contribute much to the process of economic transformation and integration. However, this sector suffers from the climate-changing process due to its impacts on tourism resources, tourism products, and tourism infrastructures. This paper aims to provide a comprehensive literature review of ongoing research on the concept and application of sustainable tourism development and climate change in the Vietnamese Mekong delta. The research discusses the literature on the concept of sustainable tourism development and offers an in-depth evaluation of the correlation between tourism and climate change in the area. In reality, there is insufficient strategic planning for the tourism industry in the context of climate change. Sustainable tourism development is recommended as a vital approach for the regional tourism sector, offering long-term adaptation to climate change in the context of the Mekong delta.

Keywords: climate change, Mekong delta, sustainable development, tourism.

Classification number: 7

1. Introduction

The concept of sustainable tourism development has been used as an important principle and an effective tool to manage numerous tourism destinations around the world. The primary purpose of this tool is to provide methods to amplify positive impacts and reduce negative ones in tourism development.

Despite receiving much attention from academics [1-5], managers, and planners, the concept of sustainable tourism development remains under debate. This is due to the numerous approaches and ways in which sustainability can be theorised and implemented. C.M. Hall (1998) [6] has highlighted that the main aim of sustainability is to protect livelihoods, culture, society, and the environment. To achieve this aim, sustainable development requires the involvement of all stakeholders and strategic planning [7]. From this definition alone, it becomes evident that sustainable development is a

multifaceted and expansive concept encompassing many dimensions of human life.

Parallel to the concept of sustainable development, the more specific embodiment of the sustainable tourism development concept also continues to undergo a period of debate and assessment. R. MacLellan (1997) [8] has observed that although there is a consensus regarding the contribution of sustainable tourism development at macro levels, there is no universal agreement on what the term 'sustainable tourism development' precisely signifies. This ambiguity stems from the fact that sustainability is a multifarious, elusive, and occasionally nebulous concept [9-11]. Such ambiguity arises because people's perceptions differ based on various local contexts, leading them to adopt different principles of sustainable tourism development to shape their perspectives. As a result, numerous authors have proposed their individual nuanced definitions of sustainable tourism development [12-14]. Even though from

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the aforementioned definition, sustainable tourism development seems to lack a consistent direction, nearly all approaches share the common objective of elucidating how to effectively implement sustainable tourism development [11]. B. Garrod, et al. (1998) [15] posited that sustainable tourism development will not achieve its objectives unless tangible results can be observed. In general, sustainable tourism development is a broad concept with a variety of literature presenting a wide array of sustainable tourism development models.

The most widely accepted definition of sustainable tourism development is from the World Tourism Organization (WTO). In their report 'Guide for Local Authorities on Developing Sustainable Tourism', the WTO stated that sustainable tourism development aims to:

... "Meets the needs of present tourists and host regions while protecting and enhancing opportunities for the future. It is envisaged as leading to the management of all resources in such a way that economic, social, and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity, and life support systems" [16].

This definition is used as a guideline and a foundational background for almost all tourism projects with respect to sustainable development criteria.

Although there are many variations in understanding the meaning of sustainable tourism development, there has been a broad consensus in establishing its principles. The ultimate purpose of sustainable tourism development is to shield future generations from mass tourism development [17], with all the negative social, cultural, and environmental implications such a prospect brings. Therefore, sustainable tourism development is often understood based on three aspects termed the "Triple Bottom Line", referring to social, environmental, and economic outputs and goals [18]. The "Triple Bottom Line" suggests that tourism in a destination is sustainable when: 1) it enhances the quality of the local community, 2) it satisfies the customers, and 3) it safeguards the environment.

To concretise the "Triple Bottom Line", The United Nations (UN) has proposed 18 core principles for sustainability [19]. These principles cover a vast

spectrum of sustainability through social, economic, and environmental facets, and many of these highlight the crucial role of strategic planning and stakeholder participation in the success of sustainable tourism development projects. This implies that strategic planning and stakeholder participation is pivotal and a fundamental prerequisite for the realisation of sustainable tourism development [20].

Regarding sustainable tourism development planning, there are various approaches, including economic, physical, environmental, and community perspectives. Given that economic development is urgent and much more apparent, especially in developing economies, the economic approach traditionally dominates nearly all sustainable tourism development projects [21]. Somewhat perilous for culture and the environment, the economic returns of tourism activities frequently guide the decision-making process in many instances of tourism planning. Consequently, when implementing the economic approach in tourism planning, it often results in adverse effects on tourism activities as well as on society and the environment [22].

Acknowledging the essential role of strategic planning in the sustainable tourism development process, the WTO (1984) [23] has argued that its absence could lead to the failure of sustainable tourism development. The mission of strategic planning is to clarify every step of the sustainability process before it is executed. This includes ensuring that all primary resources are safeguarded for the future, and that environmental, social, and economic issues are addressed resources are protected for the future; and environmental, social, economic issues are addressed [12]. Strategic planning in sustainable tourism development provides a framework for policymakers, ensuring that tourism development contributes to the benefit of all stakeholders [24]. B. Faulkner (2002) [25] recommended the destination strategic management and planning model, which underscores that community participation, a comprehensive destination approach, and collaboration are core factors for a sustainable tourism development initiative.

C.M. Hall (2008) [26] posits that strategic planning, as part of the concept of sustainable tourism planning and development, seeks to achieve three objectives: 1) conservation of tourism resources;

2) enhancement of the visitor experience; and 3) maximisation of economic, social, and environmental benefits for stakeholders. The process hinges on physical development, incorporating a tourism destination action plan, objectives and outcomes based on that action plan, and a planning approach that evaluates the effects of tourism activities in the present and future environment. To address climate change, conserving tourism resources in this model would be the primary objective of any tourism planning project.

A number of authors such as R. Welford, et al. (2004) [17], P.E. Murphy (1988) [22], and J. Sadler (2004) [27] concur that stakeholder participation in the sustainable tourism development process is both necessary and crucial. The involvement of stakeholders ensures that the process progresses in the desired direction while adhering to the boundaries of development and conservation. Moreover, a sustainable tourism development process cannot achieve its objectives if it overlooks the needs of local communities [28]. This observation further underscores the pivotal role of stakeholders, especially the local community. Local community engagement and the benefits derived from it constitute the primary rationale, incentive, and outcome of involvement in sustainable tourism development. It's imperative to consider the viewpoints of host communities in sustainable tourism development, and there is an escalating emphasis on understanding the socio-cultural impacts of climate change at the grassroots level [29]. Given the current imperative that sustainable tourism development must align with climate change adaptation, community studies are increasingly crucial. Such studies significantly contribute to climate change research and can illuminate the well-being of local populations, thereby reinforcing the need for more investigation into the interplay between local governance, global climate change, and tourism [30-32]. Additionally, community participation is a crucial criterion for sustainable tourism [29]. Thus, alongside the government and business entities, local communities represent the third vital stakeholder in sustainable tourism development. In a participatory paradigm, the dynamic between these three stakeholders should manifest as collaboration or cooperation [33]. Stakeholder engagement in the sustainable tourism development process can help chart the course for future destination development [34].

Tourism contributes to 8% of carbon dioxide emissions worldwide [35]. Simultaneously, this industry is perceived as being particularly sensitive to the anticipated effects of climate change [36, 37]. This sensitivity renders tourism-dependent communities vulnerable to global climate change and its local consequences [29]. As a result, the importance of sustainable tourism has never been greater. Various standards for future sustainable tourism have been proposed, offering key environmental indicators for the tourism industry, such as climate change mitigation, pollution reduction, the use of renewables, and waste disposal, among others [1, 38].

Given the forecasted impacts of climate change and the vulnerability of the tourism sector, along with its associated social systems, there is a pressing need for research into and the formulation of strategies and policies for adaptation. Despite the critical nature of adapting to climate change, the tourism industry still does not fully comprehend this imperative [39, 40].

This article offers a comprehensive literature review of ongoing research on the concept and application of sustainable tourism development and climate change in the Mekong delta, Vietnam. In this region, tourism is burgeoning, yet it faces the escalating challenges of climate change. Within the Vietnamese Mekong delta context, sustainable tourism development is not only encouraged but is also seen as a vital approach to long-term adaptation to climate change in the regional tourism sector.

2. The Vietnamese Mekong delta and climate change consequences

The Mekong delta region in Vietnam spans a geographical area of about 40,000 km², bordered by Ho Chi Minh city to the north and Ca Mau province to the south. The Vietnamese Mekong delta is bordered by the sea on three sides with a coastline of over 736 km [41]. The region comprises 12 provinces and one city. Its tropical climate facilitates the production of unique tropical agricultural products for Vietnam. The area is known for producing tropical fruits such as mango (*Mangifera indica*), rambutan (*Nephelium lappaceum*), longan (*Dimocarpus longan*), and others. Moreover, the dense river system and the

conducive environment have fostered the evolution of unique cultural assets, both in terms of settlements and economic progression.

The Mekong delta in Vietnam boasts a typical tropical climate with an average temperature of 28°C, humidity surpassing 80%, and high rainfall [41]. These conditions are ideal for food production, especially rice and various fruits. While the region faces fewer impacts from extreme weather events such as storms compared to other parts of the country, the prolonged rainy season can adversely affect outdoor tourism activities, undermining its potential as a significant revenue source. Generally, the climatic conditions in the delta are favourable for tourism, with ten out of twelve months deemed suitable for tourist activities.

The Mekong delta has an extensive river network with canals totalling about 28,000 km. The Mekong River in Vietnam splits into two primary channels: the Upper and the Lower. Recent climate change and the construction of hydropower plants, however, have considerably affected the region's river system. Climate change has caused variations in annual rainfall, altering the regular water flow of the Mekong river. Additionally, the construction of hydropower plants upstream obstructs water flow and disrupts the river's natural progression. The delta's terrain is relatively flat and low, averaging a height of just +1 m [42]. This includes both the Upper and Lower delta. While the upper region grapples with floods, the lower region faces the threat of rising sea levels. This makes the delta susceptible to multifaceted changes in the water table.

Predominantly agriculture-based, the Mekong delta contributes fifty percent of Vietnam's rice and seventy percent of its fruit production. Ninety percent of the country's rice exports and sixty percent of its fish exports originate from this region [43]. Due to its agricultural bounty, the delta's GDP has been growing annually by 7.5% to 8.0%.

Numerous studies have been conducted on the ramifications of climate change in the Vietnamese Mekong delta, exploring issues such as rising temperatures, increased rainfall, salinisation, sea level rise, and extreme weather events [44-50].

According to the climate change scenario for 2020 [46], observational stations have recorded a consistent rise in the Mekong delta area's average

temperature over recent years. Under the RCP8.5 scenario, temperatures are projected to increase by 1.7-2.3°C by mid-21st century and by 3.2-4.2°C by the century's end. Annual rainfall is expected to surge by 10-25% by the end of the century, compared to the period from 1986-2005. In a scenario forecasting a sea level rise of 100 cm, 47.29% of the Mekong delta area faces a high flooding risk. The southwest of the delta will be the initial area to bear the brunt of the rising sea levels, followed by the central and other regions. A sea level rise of 100 cm could impact more than 4.7 million people, approximately 27% of the delta's population, leading to frequent displacements. As sea levels continue to ascend, land loss will escalate, propelling the Mekong delta towards a climatic crisis.

3. Tourism development in the Mekong delta

Boasting a wide range of tourist attractions, the Vietnamese Mekong delta region offers a wealth of natural and cultural resources conducive to tourism development. These include natural heritages showcasing the region's biodiversity and cultural heritages spanning several historical epochs. The Mekong River holds significant sway over the tourism resources in the Mekong delta. Its deep-rooted history, intertwined with "water culture" communities reliant on river networks for transport, livelihood, and societal connections, is deemed a unique cultural asset for tourism. This fertile expanse boasts thousands of orchards producing myriad delectable fruits. A convoluted network of rivers, canals, and islets enveloping the delta provides optimal conditions for a multitude of orchards, as well as various conservation and national parks. Additionally, tourists flock to floating markets, numerous pagodas, and temples, among other attractions.

Beyond these tangible attractions, intangible attributes like arts and gastronomy also stand out in the delta's tourism repertoire. The locals' livelihood has transformed into an invaluable cultural asset for tourism. The abundance of pagodas and temples enriches the religious mosaic of this multi-ethnic region. The local culinary scene encapsulates a medley of tastes shaped by centuries of colonial influence and broader Southeast Asian migrations and dominations. Numerous festivals, primarily

centred on religious or agricultural themes, are celebrated annually. "Don Ca Tai Tu", a popular folk song music genre of the delta's inhabitants, has been acclaimed as an intangible cultural heritage of humanity by UNESCO.

The diversity of natural and cultural elements in the Mekong delta has paved the way for an array of tourist destinations. Thirty-six attractions particularly resonate with tourists. Among these, the most prominent hotspots include Can Tho, Ben Tre-Tien Giang, An Giang, Ca Mau, and Kien Giang. Specifically, Can Tho captivates international tourists with its historic edifices and temples, whereas An Giang is a favoured destination for domestic, particularly religious, tourism.

Tourism accounts for roughly 4% of the region's total GDP, marking its ascendancy as an economic sector of substantial significance in the delta. As per the Ministry of Culture-Sport and Tourism, the Mekong delta welcomed 1.8 million international and 10.6 million domestic tourists in 2015, amassing a tourism revenue of nearly 8,500 billion VND (approximately 400 million USD). In 2010, there was a surge in international tourist arrivals by nearly 20%.

In 2022, the Mekong delta hosted 37,504,427 visitors, marking a 238.45% growth compared to the same period in 2021. Estimated tourism revenue for the Mekong delta stands at over 32,087 billion VND, showing a 234.46% increment from the corresponding period in 2021. The aim for 2023 is for the Mekong delta to entertain 46 million visitors [51]. Concurrent with this exponential rise in tourist influx, by 2018, the entire Mekong delta region housed 2,406 accommodation venues offering 55,888 rooms, alongside approximately 2,000 eateries catering to tourists. The workforce directly engaged in the region's tourism sector in 2018 stood at 35,408 individuals [52].

4. Global and Vietnam tourism policy on climate change

To mitigate the adverse effects of climate change, global cooperation has intensified, with concerted efforts to formulate collaborative strategies equipped with effective roadmaps and tools to address these challenges. In 1988, the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) set up the Intergovernmental Panel on Climate Change (IPCC) to furnish policymakers with consistent

scientific evaluations on climate change. The United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1992. The 1997 Kyoto Protocol and the 2015 Paris Agreement furthered the Convention's cause, with Nationally Determined Contributions, or NDCs, standing as primary response mechanisms to climate change. The most recent event, the COP 26 conference in Glasgow, UK, in 2021, saw nearly 200 countries concur on the Glasgow Climate Pact, committing to a temperature rise limit of 1.5°C and the comprehensive fulfilment of the Paris Agreement.

In 2003, the 1st International Conference on Climate Change and Tourism took place in Tunisia. Its primary objective was to enhance awareness amongst governmental bodies, the tourism sector, and other associated stakeholders. The discussions centred on the immediate and forecasted impacts of climate change on tourist destinations, the implications of climate change mitigation policies on tourism, and the onus on the tourism industry to curtail greenhouse gas emissions [53]. This conference underscored that tourism was likely one of the sectors most susceptible to the repercussions of climate change.

Subsequent to this event, a series of pertinent workshops were convened in Europe with the intention of bridging the gap between tourism stakeholders and scientists, leading to the formation of a dedicated professional group. In 2005, the Expert Team on Climate and Tourism was inaugurated in China under the aegis of the WMO's Commission for Climatology. In the aftermath, an array of guidelines and documents discussing the nexus between climate change and tourism were disseminated. The *Davos Declaration on Tourism and Climate Change* in 2007 [54] emphasised the imperative to delve deeper into the outcomes stemming from the interplay between tourism and climate change, necessitating increased adaptation efforts and emissions curtailment both by tourism businesses and destinations.

Regarded as one of the fastest-growing sectors in the 21st-century global economy, tourism has burgeoned into a pivotal foreign currency generator for myriad global regions [55]. Research, including works by C.M. Hall, et al. (2008) [56] and UNWTO (2007) [57], suggests that tourism offers a viable avenue for poverty reduction, especially in

developing nations. However, tourism is intrinsically tied to the climate, rendering it a sector highly sensitive to climatic fluctuations. As posited by UNWTO, et al. (2008) [54], climate change influences tourism through four principal channels:

1) Direct climate impacts: Extreme weather and climate events could result in damage to infrastructure, an increase in disaster preparedness needs, heightened operational costs, and business interruptions.

2) Indirect environmental change impacts: The environment is a primary resource for tourism. Environmental changes lead to alterations in ecosystems, water availability, and agricultural production.

3) Impacts of mitigation policies on tourist mobility: National or international climate mitigation policies could impact tourist flows. Transport and service costs may rise owing to the expenses associated with environmental protection.

4) Indirect societal change impacts: Climate change may diminish the GDP and wealth of populations, leading to decreased demand for tourism activities.

Conversely, tourism also contributes to climate change. The CO₂ emissions from tourism activities, such as transport, accommodation, and entertainment, account for about 8% of the total global emissions [35]. M.C. Simpson, et al. (2008) [53] maintained that significant research on tourism and climate change was conducted in the 2000s. In particular reports by the IPCC Working Group on Impacts, Adaptation, and Vulnerability, the tourism industry has been a central concern. However, "Knowledge of the capacity of current climate adaptations utilized by the tourism sector to cope successfully with future climate change is currently very limited" [54]. Although knowledge has enhanced, it appears that little has transformed in tourism practice [58]. A discernible gap exists between theory and practice in the tourism stakeholders' approaches to climate change risk management and related policy development. This gap manifests as a deficiency in tourism development strategies that account for specific aspects of climate change, with escalating risks pertaining to access or tourism operations [29]. Existing literature regarding the impact of climate change on tourism [59-61] reveals a low level of awareness among tourism

operators and policymakers and a dearth of long-term strategic planning on these intricate issues. The UNWTO, et al. (2008) [54] highlight that present-day tourism activities, destinations, and tourist flows might endure long-term repercussions from climate change and possess a limited capacity to adapt. The tourism industry must learn to acclimatise to the effects of climate change [62, 63], as it is projected that tourism businesses and destinations will confront more severe changes in the future [64, 65]. Research on tourism and climate change has centred on both mitigation and adaptation challenges, transitioning from reactive measures to a more proactive stance and aligning closely with disaster risk management, given that various facets of climate change may hinder sustainable development [29]. Mitigating and adapting to climate change necessitates technological, economic, and societal shifts, particularly through behavioural change [66]. The tourism sector can bolster climate change adaptation by integrating advanced technologies and methodologies into its operations and by heightening stakeholder awareness toward more sustainable production.

Currently, there are gaps in understanding how to address and moderate the effects of climate change, especially in developing nations and small islands. The relationship between tourism and climate change is less understood in the developing world than in nations with longer-established tourism histories. However, emerging tourism issues in these areas are among the most vulnerable to climate change. As R.V. Cruz, et al. (2007) [67] noted: "Nature-based tourism is one of the booming industries in Asia, especially ski resorts, beach resorts and ecotourism destinations which are likely vulnerable to climate change; yet only a few assessment studies are on hand for this review".

One of the most significant challenges in conducting research on tourism and climate change is that the direct and indirect impacts of climate change on tourism vary by location [68]. Isolating the directly observable impacts of climate change on tourism is challenging [69]. According to the UNWTO, et al. (2008) [54], South East Asian tourism is a vulnerable hotspot for increased extreme events, marine biodiversity loss, sea level rise, and an increased risk of disease outbreaks. However, this information is only available on a broad scale. As a result, there is a call for the development of local

knowledge capacities to fill this research gap [70]. This research project aims to address such calls for regional-scale analyses of climate change impacts on tourism.

Vietnam is among the countries facing the adverse impacts of climate change globally and is focused on developing policies and strategies to address these issues. The Vietnamese Government's Resolution No. 60/2007/NQ-CP dated 3rd December 2007 [71] and the National Target Program to Respond to Climate Change [48] have developed a strategy for addressing Vietnam's climate change concerns, proposing an eight-step climate change response. This research emphasises evaluating the impacts of climate change, raising public awareness, and adapting to the climate as primary responsibilities in responding to climate change. The government's call-to-action is one of the primary policies and serves as a starting point for this paper.

The Vietnam Ministry of Natural Resources and Environment has conducted a preliminary evaluation to identify areas and sectors in the Mekong delta that are vulnerable to the effects of climate change. This includes rising temperatures, sea level increases, floods and flash floods, storms, landslides, and droughts. The regional tourism sector will be significantly impacted since tourism operations and recreational activities are sensitive and can only adapt up to a certain point, as detailed in Table 1. In this table, tourism-related issues are highlighted in red.

Table 1. Sensitivity and adaptability levels.

Target categories	Sensitivity	Adaptability
Water resources	Highly sensitive	Adaptable to a certain extent
Agriculture and food security	Highly sensitive	Adaptable to a certain extent
Marine and coastal ecosystems	Highly sensitive	Unclear or hardly adaptable
Forestry	Sensitive	Adaptable to a certain extent
Aquaculture	Sensitive	Adaptable to a certain extent
Irrigation (mostly infrastructure)	Sensitive	Adaptable to a certain extent
Energy	Sensitive	Adaptable to a certain extent
Transportation	Sensitive	Adaptable to a certain extent
Industry and Construction	Sensitive	Adaptable to a certain extent
Tourism, Sport, and Recreational activities	Sensitive	Adaptable to a certain extent
Trade and Services	Sensitive	Adaptable to a certain extent
Residential areas	Sensitive	Adaptable to a certain extent
Health care	Sensitive	Adaptable to a certain extent
Migration	Sensitive	Adaptable to a certain extent
Natural Landscape	Sensitive	Unclear

Source: Ministry of Natural Resources and Environment [48].

While increased temperatures and drought will only cause a medium level of impact on the tourism sector, the industry will be significantly affected at a high level of impact by rising sea levels, tropical cyclones, and floods, according to the National Target Programme to Respond to Climate Change (Table 2).

Table 2. Potential impacts of climate change and sea level rise by category.

Sector, area, object	Impact factors					
	Temperature rise	Sea level rise	Tropical cyclones	Flood	Drought	Other climatic extremes
Agriculture and food security	High	High	High	High	High	High
Aquaculture	High	High	High	High	Medium	Medium
Energy	High	Medium	Medium	Medium	High	Medium
Industry	High	High	Medium	Medium	Medium	Medium
Transportation	High	High	High	High	Medium	Medium
Construction	High	High	High	High	Medium	High
Tourism	Medium	High	High	High	Medium	Medium
Health care	High	Medium	Medium	High	High	High
Natural ecosystems and biodiversity	High	High	Medium	Medium	Medium	Medium
Water resources	High	High	Medium	High	High	Medium
Residential area	Medium	High	High	High	Medium	Medium

Source: Ministry of Natural Resources and Environment [48]. Tourism-related issues are indicated by the red colour.

Only a brief and infrequent discussion by the central tourist management in Vietnam regarding the effects of climate change on the tourism sector can be found in the publication "Tourism Planning for Mekong delta to 2030" from the Ministry of Culture, Sport and Tourism [50]. It indicates that climate change may have a significant impact on tourism resources in the Mekong delta, especially those located near the seaside. The process of adapting to climate change may result in the fading or transformation of traditional cultural values. Moreover, the region's ancient cultural structures might be damaged by extreme weather events. The primary culture of the Mekong delta is based on rice agriculture, associated with cultural values such as temples and festivals, which are considered ceremonies for agricultural activities. As the economy transitions from agriculture to other sectors, these temples and festivities will gradually disappear. However, pagodas and temples are

enduring cultural values that serve as the foundation for the preservation of associated ephemeral values. Consequently, it seems inevitable that festivals will become extinct due to the absence of temples and pagodas.

5. Implications for sustainable development in the Vietnamese Mekong delta under climate change

Tourism is a resource-based industry. The instability of tourism resources in the Mekong delta due to climate change has exerted considerable pressure on the sustainable development process of this sector. The imbalance of tourism resources, considered as an environmental factor in the "Triple Bottom Line," may lead to the unsustainability of economic and social indicators.

Achieving the triple bottom lines of sustainable development through strategic planning and stakeholder involvement is paramount. According to the aforementioned three principles of the "Triple Bottom Line" [18], protecting the tourism environment, which should be a sustainable tourism resource, is the paramount goal in the context of climate change. This primary goal will determine the outcomes of the other two goals: improving the quality of life for the local community and sustainably meeting the needs of tourists.

Numerous studies assert that professional planning is the most crucial step in any climate change adaptation process [72-74]. This study highlights the considerable challenges facing the Mekong delta's tourism sector due to the absence of a strategic plan for climate adaptation. This lack leads to various adverse effects on the region's tourism industry, such as a lack of clear direction and vision for tourism development in the Mekong delta and an unsystematic approach to infrastructure development. Consequently, the tourism sector in the Mekong delta remains unsustainable and is heavily impacted by climatic conditions, as evidenced by the results of a questionnaire survey.

Therefore, it is both crucial and significant to devise an action plan addressing the challenges of climate change in the tourism sector to ensure the sustainability of the region's tourism businesses in the long term. Central and local authorities, perceived as primary players in this process, can utilise both top-down and bottom-up strategies in

collaboration with various stakeholders, such as local businesses, non-governmental organisations, scientific institutions, area residents, and tourists. This plan has the potential to serve as a blueprint for future development initiatives in the area's tourism sector.

In reality, there is a notable absence of robust strategic planning for the tourism industry in light of climate change. Implementing this plan is a lingering concern. Thus, it falls to the authorities to devise a plan and implement it both institutionally and more broadly within society. An effective way to foster widespread adoption of sustainable tourism practices is by raising climate change awareness through educational campaigns.

This paper posits that the Mekong delta's tourism development faces five significant threats from climate change: sea level rise, increased storms, heightened salinity, rising temperatures, and erratic rainfall patterns. Among these, sea level rise is deemed to present the most substantial risk. Consequently, adapting to sea level rise should take precedence in the climate change adaptation process. Each threat, however, possesses distinct characteristics. Beyond general climate change adaptation scenarios, it is vital to consider comprehensive, detailed adaptation plans for specific threats. Moreover, reinforcing the building code is pivotal when adapting tourism accommodations in the region.

This analysis suggests that a combination of both hard and soft approaches will be most effective for climate change adaptation in the Mekong delta. The hard approach predominantly targets infrastructural solutions, such as building modifications, while the soft approach focuses on non-infrastructural solutions, like climate impact mitigation strategies or initiatives promoting coexistence with changing climates. Tourism, an economic activity grounded in natural resources, is interconnected with sectors like agriculture, fishing, manufacturing, and transportation. Lessons from climate change adaptation in these sectors indicate that Mekong delta tourism cannot adapt in isolation; it must be part of a broader programme addressing economic and social facets of climate vulnerabilities. Hence, the sustainable development approach is central to the climate change adaptation guidelines for the Mekong delta's

tourism sector. The soft approach should be at the core of every initiative since evidence suggests that hard methods might be counterproductive, potentially undermining the long-term development of the Vietnamese Mekong delta. For this region, embracing the mottos 'reputation of being natural' and 'living with nature' can confer enduring benefits and foster unique local values, particularly bolstering ecotourism ventures.

Climate change presents a formidable challenge for the Mekong delta's tourism sector's development trajectory. Thus, a comprehensive evaluation of climate change impacts on tourism is imperative for the region. Currently, tourism climate change adaptation in the Mekong delta is rudimentary and lacks strategic foresight. A long-term adaptation programme is essential. For a viable and sustainable climate change adaptation initiative in the Mekong delta's tourism sector, this study recommends the steps depicted in Fig. 1.

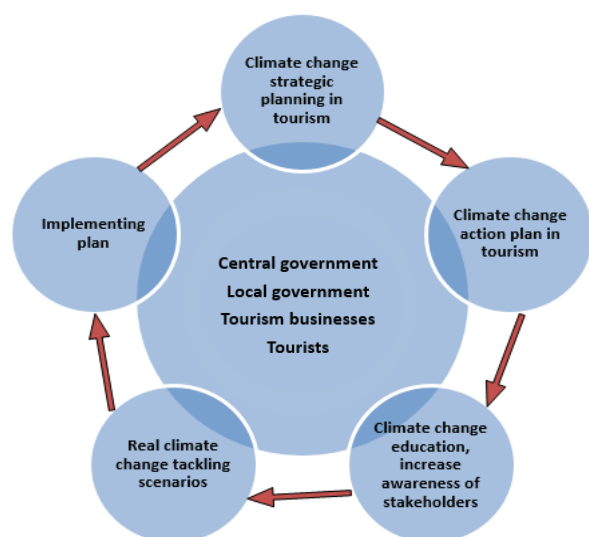


Fig. 1. Steps for a successful climate change program in tourism in the Mekong delta.

In this model, due to the pronounced centralised governance in Vietnam, both central and local governments reside at the heart of all actions. For facilitating climate change adaptation within the tourism sector, the cycle should encompass the following steps: Climate change strategic planning, tourism-climate change action plan, tourism climate change education, enhanced stakeholder awareness, climate change mitigation scenarios, and plan implementation. This cyclical approach will ensure a sustainable programme dedicated to climate change adaptation in tourism.

It is imperative to devise effective strategies addressing climate change's impact on the Mekong delta's tourism sector. This onus hinges on substantial backing from both local and central government entities as well as local agencies. Moreover, this analysis offers a panoramic perspective on climate change repercussions and adaptations in the Vietnamese Mekong delta. Consequently, further research, especially scientific studies focused on climate prognostications, is essential to elucidate the precise state of climate change impacts and adaptation strategies, notably at specific sites and tourist destinations.

CRediT author statement

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COMPETING INTERESTS

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

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Revealing the invisible: A phenomenological reading of N.B. Phuong's *The Absent* (1999) and W. Faulkner's *As I Lay Dying* (1930)

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Abstract:

This article conducts a comparative analysis of the concept of invisibility within two literary works: *The Absent* (Nguoi di vang, in Vietnamese) by N.B. Phuong and *As I Lay Dying* by W. Faulkner. It employs M. Henry's phenomenological insights into life and aesthetics as a theoretical framework to delve into the expression and perception of invisibility in these texts. The study demonstrates that invisibility plays a dynamic role in both novels, exploring how it is articulated, revealed, perceived, and comprehended. By immersing characters in states of dying and coma, these narratives facilitate an exploration of the invisible as a perceptual experience. Both authors delve into the realm of invisibility by granting voices to the earth and its inhabitants, simultaneously emphasizing the silences and gaps in human communication. The central objective of this article is to identify common themes and perspectives related to the manifestation of life in these two writers' works. Both N.B. Phuong and Faulkner conceive life as fundamentally invisible, with art serving as the means to unveil this invisible life.

Keywords: invisible, M. Henry, N.B. Phuong, phenomenology of life, W. Faulkner.

Classification number: 9.2

1. Introduction

As I Lay Dying is regarded as one of the greatest novels by W. Faulkner, the winner of the 1949 Nobel Prize in Literature. The novel centres around the death of a matriarch and follows the efforts of her family to fulfil her wish of being buried in her hometown. In parallel, *The Absent* (1999) stands out as a notable work by contemporary Vietnamese author N.B. Phuong. This novel explores the behaviour and psychology of family members after the wife is involved in a severe accident and falls into a comatose state. Both *The Absent* by N.B. Phuong and *As I Lay Dying* by W. Faulkner delve into themes of disappearance, secrecy, the unseen, and memory within the context of the family unit. These shared themes create a haunting and emotional atmosphere that draws readers in.

This article's premise is based on a hypothetical scenario: What if the titles of the two novels were swapped? How would Faulkner's eerie and evocative novel be perceived if it were titled *The Absent*, while N.B. Phuong's book was named *As I Lay Dying*? Exploring this hypothetical scenario broadens one's perspective on the connections between the different categories present within the titles of these works. The article raises questions about the relationship between the dying and the absence of these two novels. Specifically, it ponders whether the concept of dying in

W. Faulkner's work is linked to the idea of absence, and whether the absence depicted in N.B. Phuong's novel could be interpreted as a form of dying. Through an examination of the various meanings associated with each category, a unifying element connecting them both emerges - an element that transcends the boundaries of the two works: the invisible. The concept of the invisible employed in this article is derived from phenomenological perspectives, particularly M. Henry's phenomenology of the invisible. M. Henry is widely recognised as a leading phenomenological thinker who has dedicated considerable attention to the concept of the invisible [1], to the extent that he can be characterised as "an ambitious attempt to develop a *phenomenology of the invisible*" [2]. The study pays particular attention to his three aspects of the invisible: the perceptual experience, its dynamic manifestation, and the eternal nature of the world. The paper seeks to identify the ways in which writers strive to create unique and distinctive literary languages to manifest the invisible life.

The subsequent sections delve into the concept of the invisible as explored in both novels, highlighting how it contributes to the writers' exploration of the nature of life. Comparative reading and text analysis are applied in this paper. Both novels reject any interest in the visible and exterior world, and they use dying and coma as conditions to support this denial. Both authors endeavour

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to delve into the voice and form of the invisible, expressing it through their work. The following part illustrates moments of revelation in the form of the invisible. The paper culminates with an examination of the writers' endeavours to visualise life as invisible, original, and eternal. These themes are concentrated in the discourse of the earth.

2. Rejecting the external world: Dying and coma

At first glance, a striking similarity between the two novels is their exploration of a family's experiences of unfortunate events centred around the life of a wife/mother. As *I Lay Dying* tells the story of the Bundren family, which begins with the death of Addie and follows the family's journey to take her body to the family cemetery in Jefferson for burial. *The Absent* centres around a family in which the wife, Hoan, suddenly experiences a severe accident and falls into a prolonged coma, with the story concluding with the woman's final moments of delirium. Both Addie and Hoan kept the secret of an affair hidden. The characters and their family members are put under tension by the proximity to and approach to death, which exposes buried secrets and loneliness.

When comparing the two works side by side, the condition of dying and being in a coma, as represented by the body, emerges as a key theme. By placing characters in states of dying and coma, both writers are seen to explore the body in a phenomenological sense, prioritising the internal, spiritual body over the external, material one. In this regard, the worlds depicted in both works become a phenomenological representation of invisible life rather than a biological representation of visible life.

The notion of invisibility can be scrutinised through diverse perspectives. M. Nitsche (2020) [1], in his analysis, provides a concise overview of several theoretical and practical discourses concerning invisibility in religious experience. Fundamentally, the concept of the invisible is addressed through three primary approaches, namely theological, anthropological, and sociological. In theology, the invisibility of the Divine highlights the *absoluteness* of the divine world over the visible world. Invisibility can be seen as "a condition of possibility of *sacred revelations* or even miracles" [1]. Cultural anthropology and sociology shed light on diverse social practices of invisibility within religious encounters. Such practices encompass "covering of one's own body" and "social hiding" [1]. In all three approaches, M. Nitsche argues, "the invisibility indicates a hiddenness of what is not directly experienced" [1]. These approaches underscore the "hiddenness", the "covering", and the limitations associated with entities that are unseen or not directly experienced.

Phenomenology presents an alternative perspective on the concept of invisibility. The works of Husserl, Heidegger, Henry, and Merleau-Ponty offer intricate and multifaceted insights into the interplay between phenomenality and invisibility. As such, the phenomenological method "does not understand the invisibility as a limit of what can be directly experienced but rather as a dynamic component of the relational nature of any experiencing" [1]. Phenomenology diverges from the previous approaches in that it does not consider hiddenness to be a fundamental element, nor does it concentrate on social interactions, but rather regards visibility as an integral part of our perceptual encounters. In contrast to the preoccupation with a focus on *appearing* and the boundary between the visible and the invisible, phenomenology is primarily concerned with the *manifestation* and the interwoven relationship between the visible and invisible.

The body is an inseparable entity between internality and externality. "At any rate, we constantly experience the fact that every phenomenon can be lived in two ways - externally and internally - with respect to one phenomenon that never leaves us, that is, our own body. For, on the one hand, I live this body internally (...) I fall completely into its pure subjectivity to the point of being unable to differentiate myself from this hunger, this suffering, etc. On the other hand, I also live this same body externally, because I am able to see it, touch it, and represent it as one represents an object, in general, as an external reality more or less analogous with other objects" [3]. M. Henry (2003a) [4] was preoccupied with the pure subjectivity and internality of the body, recognising that it is through this power that the body "constitutes the universe" and allows us to "open ourselves to this world itself" [4]. The phenomenological body, therefore, is "no longer a visible body but a flesh - an invisible flesh".

The act of placing characters in a state of dying or coma intentionally deprives the body of its ability to express its senses beyond the physical realm. Being faced with an immobile body, lying in a state between life and death, inevitably leads to confusion, unease, and tension for those in contact with it.

Both novels feature the eyes of the dying or unconscious character, giving readers an insight into the part of the body that others can observe through the senses and that displays the movements of life and spirit. It is worth mentioning that in both novels, the true life's energy in the eyes is depicted as a tendency to break out from the eyes, serving a role as a material, exterior, concrete part of the body. "Only her eyes seem to move. It's like they touch us, not with sight or sense, but like the stream from a hose touches you, the stream at the instant of impact as dissociated from the nozzle as though it had never been there" [5]. The life in the eyes is no longer of

Addie or Hoan, but enters into the life of the female eyes in the universe: "She watches me: I can feel her eyes. It's like she was shoving at me with them. I have seen it before in women. Seen them drive from the room those coming with sympathy and pity, with actual help, and clinging to some trifling animal to whom they never were more than pack-horses" [5]. Thus, it is only when the other person also closes their eyes, avoiding a physical collision with the comatose person's "open eyes" that true empathy emerges. For instance, in *The Absent*, Thang "closed his eyes, with darkness flooding him from the top of his head to his chest and covering his whole body. Amidst the vast sea of darkness, Thang suddenly realises that the situations of Hoan and Dieu are strikingly similar" [6]. The revelation becomes visible through the appearance of the invisible.

When the body becomes invisible, what remains in the two states, dying and coma, is the voice. It is the voice in the mind brought to life by literature in the form of words. Despite Addie and Hoan's biological bodies appearing as corpses from the beginning to the end of each novel, the characters' voices remain a constant presence. The voice of the dying can be seen as the central voice in a chorus of voices from an invisible universe in the two works. This will be clarified in the next section.

3. Revealing the invisible: Voices of life and silence of human

The foregoing suggests that by pushing characters' bodies into states of dying and coma, the novels pave the way for exploring the invisible as a perceptual experience. This section posits that the voices in these two works epitomise a dynamic world of the invisible.

As a phenomenologist, Henry did not focus on mere appearance when observing life. Instead, he concentrated on manifestation. For Henry, manifestation is primarily the "self-manifestation of being". By its very nature, this "self-manifestation of being" cannot appear within the visible realm of worldly exteriority; it is inherently invisible. He contends that self-manifestation is intrinsically an invisible revelation. Consequently, "invisible" becomes a foundational concept in phenomenology: "The original revelation of the essence to itself, constitutive of its reality, is the invisible. As it represents the primary revelation of the essence to itself and its reality, the invisible is not merely the opposite of phenomenality, but its primary and essential characteristic" [7]. As M. Henry (1973) [7] cites Eckhart, "the true light shines in the darkness, even if no man recognises it". M. Henry posits that true life is innately invisible, revealing itself through the invisible. This is predicated on the idea that the experience of sensing life isn't externally observable and doesn't manifest within the visible world. In essence, invisibility isn't about mere appearance or concealment, but rather a core trait of

genuine life and its manifestation. It is not a boundary of direct experience but the very force that shapes the eternity of the world.

I am akin to a flowing stream, fond of the moments before dawn when the light has yet to touch everything, and the bluish hue of an invisible body emerges suddenly in the cool, pure early dew. There was once a boy named Thang who was bathed in my essence [6].

I greet the morning with a tremble, for I hold a secret (...) I journey through this dusty world, transported to a time long past... The leaf is pure and revered above all others, for it never mates [6].

It is a confession from the Linh Nham river, or the voice of the banana leaf, in *The Absent*. The words about time and chastity are spoken with sacred and arrogant rapture. As readers delve into N.B. Phuong's novel, they are enveloped by a symphony of voices representing every being in the entire universe. "To N.B. Phuong, *banana leaves, clods, the ground, thunder, lightning, rain, clouds, morning, weevils, cows, caries, dragons, fireflies, air, fog, shoes, labels, pine trees, lights, foetuses, bells, pots, and everything else* in existence all have a voice and "act" on the environment, existing as entities no different from humans" [8]. Entities that seem inactive, without perception, soulless or non-existent, are imbued with a voice, a form, a presence. Listen closely to the breath of life that pulsates through all these creatures. Within these beings, one can find the dry branch that knows pain and "squeaks and spreads into many crumbs" [6], the sad grass that knows fear as "the grass goes madly" [6], the handful of earth that breathes and "puffs with the breath of the Ky... in the quiet darkness of the night" [6], and the forest carrying the voices of thousands of trees, with "the sound of a thousand trees whispering bringing a hearty aroma" [6]. There are also the voices of unformed souls: an unborn child who says, "I am a foetus, my mummy aborted me but I do not cry", and of past life souls asking the face of the daughter, "Were you me in the past? - Yes!" The girl's face was slightly blurred by her own response" [6]. For the inherently invisible entities, writers not only portray them to give them shape but especially transform them into talking characters, to endow them with a voice. D.C. Thi (2006) [9] wrote, "His world [N.B. Phuong] is, therefore, both empty and full, silent yet noisy, invisible yet visible, real and virtual, with yin and yang mixed".

One can read *The Absent* from various angles, such as an interest in the spiritual world, faith, or even from the perspectives of pathology or paranoia. From a phenomenological standpoint concerning the invisible, it can be understood that N.B. Phuong's novel gives form to the life of entities, nature, creatures, and phenomena that exist right beside us but which we neither know nor feel. Man, due to his sensory limitations or perhaps because

of his arrogance, has relegated all these phenomena to the invisible realm. By revealing the life of the beings in the universe, the "human" no longer retains a unique value and no longer holds the power to dominate and shape the world as in the classical view. The "human", therefore, is merely a part and a voice in the world around him. In the title *The Absent*, where "ngươi" (in Vietnamese) can be translated as "human", the phrase "di vắng" (in Vietnamese) refers to a state of being absent, whether through coma, death, fainting, or simply a lack of presence. However, this absence facilitates the manifestation of the entire universe, the earth, and all its creatures and phenomena, which are given form in the novel. "The Absent" can also be translated as "The invisible", alluding to the entire universe, a world where spirits manifest themselves in a concealed and enigmatic manner.

This perspective aligns with Henry's contemplation of other forms of life: "Is it not paradoxical for anyone who wants to know what life is to go and ask protozoa or, in the best case, honeybees? As if our only relation with life were a wholly external and fragile one with beings about whom we know nothing - or so very little! As if we ourselves were not living beings!" [10]. His interest in how the natural world connects to the ego's invisible life led him not to use the term "world", but to start referring to "earth" in *Barbarism* (1987). For Henry, "caring for nature, therefore, involves abandoning the "transcendental egoism" that confines the ego within the horizon of reason, granting him or her the power to dominate everything in the exteriority of the world" [11]. When N.B. Phuong (1999) [6] breathed life into the invisible world in his novel, he presented a more holistic view of the universe, one that includes plants, animals, phenomena, and the balance of yin and yang. They were all in search of their true selves, as the banana tree muses: "Why am I here? Why am I a banana and nothing else?".

The moment of revelation is often marked by instances of contact between humans and objects, leading to sudden and profound realisations and insights. "Son grasps the nearest cane root, uproots it, and hears the sound of the leaves clashing sharply and coldly. He shook off the soil from the cane root and held it up to examine the short roots, which resembled a scattering of crab's feet, "Eat." Then, he compelled himself to bite into the cane, and suddenly his entire body was consumed by a sensation reminiscent of a scream in the pitch-black night. One of his legs seemed to detach itself from his body, acting as though it had a will of its own" [6]. Sometimes, revelation falters when humans cannot connect with the invisible world to alleviate their loneliness. This is mirrored in the subdued desolation of Hoan and the souls: 'The girl clung once more to the nacre branch and then gradually sank into the dense atmosphere surrounding her. In *The Absent*

[6], "Hoan turned and walked away slowly, his weeping reaching the foot of the bridge before dissipating in the silence of a time that had passed" [6].

While W. Faulkner's novel is notably different concerning the revelation of the invisible world. Unlike the auditory richness of the invisible universe found in *The Absent* as mentioned earlier, this isn't the impression we receive from reading *As I Lay Dying*. W. Faulkner doesn't dedicate much space to describing nature, trees, rivers, or mountains. Perhaps, from our viewpoint, N.B. Phuong's novel showcases the distinct beauty of Oriental literature, highlighting spirituality and a harmonious view of creation, reminiscent of the Lao Trang theory. This theory stresses the balance and interconnectedness of all things in the universe. Nevertheless, a deeper contemplation of the invisible prompts us to examine the work with greater scrutiny. This realisation brings to light numerous moments in *As I Lay Dying* where humans and non-humans merge into one existence. The most succinct chapter in the novel features Vardaman's thoughts on his mother: "My mother is a fish" [5]. In an unusual manner, Vardaman equates his mother to a fish, experiencing emotions of self-degradation and defilement that mirror the sight of a severed fish writhing on the ground. Consider Tull, a poor white farmer, when he gazes upon his mule - an animal synonymous with agriculture:

When I looked back at my mule, it was like he was one of these here spy-glasses and I could look at him standing there and see all the broad land and my house sweated outen it like & was the more the sweaty the broader the land; the more the sweat, the tighter the house because it would take a tight house for Cora, to hold Cora like a jar of milk in the spring; you've got to have a tight jar or you'll need a powerful spring, so if you have a big spring, why dies, you have the incentive to have tight, well-made jars, because it is your milk, soar or not, because you would rather have milk that will sour than to have milk that won't, because you are a man [5].

It is hard to distinguish between Tull's point of view and that of a mule. In other words, Tull identifies with the mule: the more he ploughs the field, sweats on the land, and invests in his home, the more likely he is to win a woman's heart. W.C. Dimock (2012) [12] perceives the mules as "a perfect analogy for the poor white" and continues to do so with horses, buzzards, snakes, and non-humans in the Greek epic. We should not interpret these images purely metaphorically. Rather, it's the intrinsic blending of human and non-human in the universe, although, admittedly, this idea does not really stand out compared to Faulkner's other novels, and in this comparison, it does not stand out like N.B. Phuong's *The Absent*.

Faulkner's revelation of the invisible world in *As I Lay Dying* is, in our opinion, all the more striking on the other side: the secret gaps between people. When reading *The Absent*, it is interesting to see what both works have in common: using language to reconstruct the endless invisible spaces between people. The similarities between the two novels are easily seen in their narrative techniques, such as multi-point perspective and the use of temporal equivalence between past and present. Even in most works, it is difficult or almost impossible to identify the narrator or the object being told. Most of the time, the reader has to go to the back of the story, to return to (perhaps) explain what (the external event) was told in the previous paragraph.

The story in both works contains many secrets: the dying mother concealed the secret of adultery, and every husband, child, and friend have their own pasts, sins, desires, and obsessions that are challenging to discuss. Both works feature characters with secrets, which are unveiled through live dialogue or the characters' avoidance of sharing their true thoughts and feelings with one another. Secrets also emerge on another level: between the work and the reader (the text deliberately obscures, blurs, and challenges the reader to uncover the truth). This concept is evident in *As I Lay Dying*. W. Faulkner (1930) [5] often allows his characters to tell stories in fragments, preferring to use the pronoun "it" instead of the personal pronoun that typically indicates a specific subject: "Then it wasn't. It hadn't happened then. It was lying right there on the ground. And now she's getting ready to cook it". Only on page 84, when the reader returns to Vardaman's words, do they grasp the boy's fear that his mother, represented by the fish, will be cooked. This writing style is prevalent throughout the work. Thus, a theme that pervades the work is "Words of Secrets" [12]. The ambiguity of the narrator, the object of narration, and the content narrated are pushed to an extreme in *The Absent*, perhaps because of the dense presence of invisible voices in the universe intermingling with human speech. The secretive language, or the inability to speak and understand, characterises both Faulkner and N.B. Phuong.

However, the objective of these works isn't to unearth the truth or facts (even if sought, they remain elusive). The fascination in both novels, in our view, is the acknowledgement of secrets that never disclose themselves and spaces that never fill. The bond between humans isn't solely based on physical communication through words. Silence and the absence of speech forge an unseen void between individuals, a space of absence. One could argue that they can't connect through that invisible vacuum. Conversely, within these invisible voids might lie the genuine connection between them: loneliness, mistrust, greed, deception, selfishness, and pain. The tension between members of Hoan and Addie's families is manifest in the intangible realm.

The aforementioned section suggests that both N.B. Phuong and W. Faulkner delved into the realm of the invisible, giving voice to the earth and its inhabitants, while highlighting the silences and gaps in human communication. Through attentive listening, and by endowing both invisible and visible beings, whether real or virtual, with form, voice, and vitality within the universe, these authors have engaged with phenomenology in the context of the dynamic world of the invisible. As a result, the role of humankind is redefined as a humble component of the earth. The authors use language not only to highlight the limitations inherent within language itself but also to explore the genuine connections that exist between individuals through the medium of language. Ultimately, the concept of the invisible acts as a narrative of ontology.

4. Into the essence of life: The earth

The concept of the invisible ultimately delves into questions of ontology. From this perspective, both novels can also be explored as inquiries into the essence of life. Phenomenology regards the invisible as a manifestation of life itself. In this section, we will analyse how these two works present the invisible as an intrinsic, sacred, and enduring element of existence, exemplified through the discourse on the earth. In both narratives, there is a realm of life and death, where all visible bodies eventually become invisible earth. As a result, it stands as a testament to the origin, sanctity, and eternity of life. Within the sacred and eternal earth, the shortcomings, vices, and limitations of human life are laid bare.

Firstly, the earth is the place where life is preserved. "Holding onto the earth" or "separating from the earth" is a concept closely tied to life and death. N.B. Phuong (1999) [6] wrote about the soul of the girl who died by hanging: "It was not the rope that killed the girl. All of human life is spent walking on the ground, but once we leave it, everything is finished". Leaving the earth means that humans and all other creatures are separated from the source of life. In one of the quotes above, Son pulls up a cane and "observed the small roots fluttering about like the legs of a crab," and suddenly, "his entire body lit up like a scream in the dark, and one of his legs detached as if it were an entirely independent body" [6]. W. Faulkner (1930) [5] describes the last minutes of the mules' struggle in the middle of the river during the flood season, also with their feet detached from the ground: "They rolled up out of the water in succession, turning completely over, their legs stiffly extended as when they had lost contact with the earth". W.C. Dimock (2012) [12], reflecting on the image of mules as a metaphor for farmers, said: "Mules are creatures with feet of clay. What's clear in this sequence is that because they are creatures with feet of clay, they

can only survive when they are on solid earth". And so, this image is akin to a metaphor for poor white farmers: "Once they're taken out of their environment, we know that terrible things are going to happen to them" [12]. But when juxtaposed with *The Absent*, we can consider the discourse about the earth in W. Faulkner's novel from a different perspective. It is not only associated with livelihood, but more broadly, it is W. Faulkner's reflection on the land as the place where human life and death are preserved, which will be discussed in the subsequent passages.

In W. Faulkner's and N.B. Phuong's novels, the earth serves a role beyond merely sustaining life. It also functions as the ultimate resting place for the deceased. It is portrayed as the destination where all visible bodies eventually transform into invisible ashes. Consequently, it assumes the sacred and potent role of bearing witness to the enduring and fundamental nature of life. Both works vividly depict *the journey of death* for both humanity and creation, with the earth serving as a majestic witness across countless generations.

As *I Lay Dying* is a journey to overcome flood and fire to bury the mother's body in the ground. This journey is imbued with epic and symbolic significance. "Against God" [5], despite divine will, people persist, determined and brave, in carrying their mother's body to the earth in accordance with her wishes. That woman, in her final moments, yearned for the sanctuary of the earth. This is the last spark of life in the eyes of the dying woman: "That pride, that furious desire to hide that abject nakedness which we bring here with us, carry with us into operating rooms, carry stubbornly and furiously with us back into the earth" [5]. It represents the desire to bury the exposed, visible body and return it to invisibility, to be safely preserved in the earth's eternity. "The reason for living is getting ready to stay dead" [5], Addie said. Ultimately, death returned. The invisible dust is the eternal resting place of both creation and man.

In *The Absent*, the earth becomes the repository of memory, where paths of life converge, serving as a destination for both humanity and creation to seek revelation. It is on the earth where memories are preserved. The land of Thai Nguyen narrates the story of the generations that lived and perished. Stories ranging from Princess Dien Binh in the twelfth century during the Ly dynasty to the Thai Nguyen revolt of Doi Can and Luong Lap Nham in the early twentieth century, as well as the contemporary story of Dien's family and Khanh, all coexist and unfold on the same land. The earth endures, eternally majestic, bearing witness to countless changes, births and deaths. "Dien sighed, and a hundred years ago, Luong Lap Nham sighed as well, leaning back against the wooden gun rack" [6]. Thanks to the earth, memories do not fade;

while visible forms may vanish, invisible memories persist. The earth serves as the meeting place of life and death, where past souls encounter future lives, unborn fetuses seek their mothers, banana leaves return to their wild origins, and the great forest echoes the battles of bygone armies. Hoan witnessed wandering souls, meeting their past lives at the foot of the bridge. She sought liberation, while the soul of the young girl also yearned for release from the "harsh earthen rope", but it remained elusive.

Placed within the context of the eternal earth, the visible and finite aspects of the body and the human being appear more exposed than ever. Addie's rotting body emits a foul odour, drawing vultures towards it. Hoan's body, described as beautiful and charming, also withers, emitting a foul smell and appearing unclean. "Compared to the tree of life, people become so sordid. Who would dare to throw themselves down like the pine tree, and who would possess enough willpower to rise with the same majesty? Humans fall too quickly, while trees endure, even in death" [6]. Thus, in both works, the journey of death, the return to the earth, represents a journey to the invisible and eternal.

On the sacred and eternal earth, the degradation, ugliness, and finiteness of human life are portrayed as both humorous and tragic. It is human actions that mock and infringe upon the land's sacredness. In *The Absent*, when humans violate the sacred land, they face formidable retribution. Thang's family removed the ancient wooden house, which was seen as a violation of the land's history. From that point, there was "a hunch that after her mother's farewell, something was approaching her family, a movement, a discreet but irresistible force" [6]. The land showed its displeasure through a black mass and a heatwave as they dug the foundations. Misfortune befell all family members, as if they were under a curse, seemingly from some higher power. These omens hinted at the looming end to human degradation. Each individual in that family bore their own burdens - illnesses, ambitions, deceits, and delusions - and each encountered their own form of retribution. Hoan, the adulterous woman, slipped into a coma after an accident; Thang constantly heard the voice of the crooked soldier he killed in Quang Tri; Son met his demise whilst stealing a suitcase; Khanh felt queasy; the paralysed old man... The world described in the story is "a collection of lonely blocks, each carrying their own cross on the journey to death" [8].

In *As I Lay Dying*, although there is no direct mention of human encroachment on the land, the novel satirises a sacred burial ritual found in the original legend. The funeral procession, echoing the burial of King Osiris, is depicted in *The Golden Bough* by J.G. Frazer (2009) [13]. Egyptian legend speaks of King Osiris being betrayed and slain. His kin mourned, searched for fragments of the

king's body, and performed rituals with the deceased. Osiris was resurrected and became the "Lord of Eternity" [13]. From then on, Egyptian burial rituals mirrored the ceremonies devoted to Osiris, where husband and wife, children, and friends gathered around the grieving corpse to practice rituals, hoping the deceased might be reborn. The legend and ritual of the god Osiris nourished the ancient people's hope for eternal life: "In the resurrection of Osiris, the Egyptians saw the promise of an everlasting life for themselves beyond the grave. They believed that everyone would live eternally in the afterlife, provided their surviving friends did for their body what the gods had done for the body of Osiris" [13].

The journey to bury Addie, on the one hand, revives the bond of friendship from the legend of King Osiris, where the entire family unites to lay their mother to rest according to her wishes. On the other hand, it reveals loneliness, detachment, indifference, and deceit within the family itself. Alongside them on this pilgrimage to the immortal land to attend the woman's funeral, her husband and her children each harbour their own secrets, ambitions, and personal survival strategies. Anse, the husband, wishes to get new teeth; the son hopes to earn three more dollars by offering a ride; the daughter contemplates an abortion; and the youngest child is solely concerned about his train set. And in W. Faulkner's narrative, can the deceased be reborn, as in the original myth? "My mother is a fish" [5], "the underside caked with dust where it is wet, the eye coated over, humped under the dirt" [5]. Much like Hoan, Addie finds no tranquillity, no rebirth: they bring to the earth their secrets, shame, and the humiliation of humanity. W. Faulkner's deconstruction of the reincarnation myth serves as a poignant reminder of the transient and flawed nature of human life when juxtaposed with the sanctity and perpetuity of the earth. Thus, it's evident in both novels that the earth is pivotal in intertwining the visible with the invisible, crafting a portrayal of the essence of life.

5. Conclusions

This article offers an interpretation of the notion of "invisible" in the two novels: *The Absent* (1999) by N.B. Phuong and *As I Lay Dying* (1930) by W. Faulkner. The theoretical foundation of the paper largely draws from M. Henry's phenomenological understanding of the invisible, which is paramount to the concepts of life's manifestation. According to M. Henry, the invisible isn't merely something unseen or obscured, nor is it due to restrictions in firsthand experience. The invisible is an intrinsic dynamic of any experience. Life self-represents in the invisible realm, and the arts are the medium that shapes the invisible.

The study probes how the invisible in the two novels aligns with M. Henry's perspectives on invisibility. The invisible operates as an active element in both books.

The worlds illustrated in these novels are realms of the unseen, encompassing the voices of all beings, both seen and unseen, human and non-human (particularly in N.B. Phuong's novel), as well as the silence and inherent inefficacy of language and human interaction (as demonstrated in W. Faulkner's narrative). Additionally, invisibility touches upon the very core of existence. Both narratives shed light on the ephemeral, observable nature of human existence, set against the backdrop of the eternal, sacred, and imperceptible true life. To articulate these phenomenological notions, discourses around the body, voice, and earth play a significant role in both novels.

CRediT author statement

Thi Van Anh Ho: Writing, Translating and Editing; Thanh Nga Le: Writing.

COMPETING INTERESTS

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

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Table of contents in 2023

No	Author	Title	Classification number	Volume (Number)	Page
1	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	Mindsponge-based investigation into the non-linear effects of threat perception and trust on recycled water acceptance in Galicia and Murcia, Spain.	Other Psychology (1.4) Other Social Sciences (7)	65 (1)	3
2	Thi Le Uyen Vo, Thi Nga Nguyen	Application of SEM in analysing the effect of competitiveness, operating effectiveness and risk management on the stability of Vietnamese construction corporations.	Economics (2.1) Business and Management (2.2)	65 (1)	11
3	Dieu Linh Ha, Thi My Linh Nguyen, Van Hoang Nguyen, Gia Huy Tran, Duc Kien Nguyen, Khanh Huyen Trinh	Determining factors affecting innovation capacity of students at economic universities in Hanoi.	Economics (2.1) Sociology (4.1)	65 (1)	24
4	Tran Minh Hieu, Le Phuoc Huy	Factors affecting customers' satisfaction on mobile banking service quality at Asia Commercial Joint Stock Bank.	Business and Management (2.2)	65 (1)	34
5	Thi Hai Vu, Thi Diem Hong Phi, Dang Hoc Nguyen, Quang Trung Tran	Agricultural cooperatives and climate change adaptation - Case study in Son La, Vietnam.	Business and Management (2.2) Sociology (4.1)	65 (1)	41
6	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	Behaviours of restaurants in a beef value chain in Dien Bien province.	Business and Management (2.2) Other Social Sciences (7)	65 (1)	54
7	Nguyen Thi Hong Nguyet	Determinant factors influencing smartphone customer's brand loyalty in Ho Chi Minh city.	Other Economics and Business (2.3) Sociology (4.1)	65 (1)	62
8	Quy Van Khuc, Shawn Leu, Hien Nguyen, Nguyen Truc Le, Thuy Nguyen, Hoang Khac Lich, Thi-Hong Nguyen, Nguyen Thuy Anh, Duc-Bao Nguyen, Thang Ngo, Phu Pham, Le Thanh Ha, Phuong Luu, Nguyen Duc Lam, Trung Tran	Government pandemic policies associated with vaccine fund and vaccine diplomacy in response to COVID-19: A critical study of the Vietnamese experience.	Sociology (4.1) Political Science (5.1)	65 (1)	70
9	Hoang Khoi Nguyen	Climate justice in Vietnam's green transformation: A three-dimensional analysis of the green growth and climate change mitigation sectors.	Sociology (4.1) Political Science (5.1)	65 (1)	90
10	Nguyen Huu Nhuan, Nguyen Thi Thu Huyen, Ngo Thi Khanh Ly	Overview of gender mainstreaming in agriculture and rural development in Vietnam.	Sociology (4.1) Other Social Sciences (7)	65 (1)	100
11	Huu Can Nguyen	Using expert evidence on intellectual property: A practical perspective.	Jurisprudence (6)	65 (1)	110
12	Van Nghia Hoang, Thi Van Anh Pham	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.	Jurisprudence (6) Other Social Sciences (7)	65 (1)	116
13	Nguyen Hoang Nam	Impact of cryptocurrencies on financial markets.	Economics (2.1)	65 (2)	3
14	Nguyen Huu-Dung	Economic valuation from direct use of melaleuca forest at U Minh Ha National Park, Vietnam.	Economics (2.1)	65 (2)	16
15	Duong Nguyen Minh Huy, Do Anh Duc	Travelling, retail activities, trade openness and COVID-19 incidence in Vietnam.	Economics (2.1)	65 (2)	26
16	Hien Thu Pham, Hoang Giang Nguyen, Alexandra Bratanova, Vu Hoang Dat	Tracing innovation efficiency: Review and bibliometric analysis.	Business and Management (2.2) Other Social Sciences (7)	65 (2)	32

17	Phuong Giang Le, Hung Anh Le, Xuan Thang Dinh, Huu Hai Trinh	An assessment of the current situation and recommendation of management scenarios for municipal solid waste management in Ho Chi Minh city.	Business and Management (2.2) Other Social Sciences (7)	65 (2)	45
18	Minh Khoa Nguyen	Suggestions on extended producer responsibility mechanism in Vietnam from international experiences.	Other Economics and Business (2.3) Other Social Sciences (7)	65 (2)	57
19	Tran Chi Kiet, Doan Vinh Thang	Students' preferences for attributes of a B1 English level course: A conjoint analysis.	Curriculum and Pedagogy (3.2)	65 (2)	65
20	Bui Bich Thuan	Digital literacy of Vietnamese human resources.	Curriculum and Pedagogy (3.2) Other Social Sciences (7)	65 (2)	71
21	Anh Thuy Dung Nguyen	Standards of independence and impartiality in the context of international commercial arbitration.	Jurisprudence (6)	65 (2)	85
22	Tran Ngoc Dung	Rubber industry in Southern Vietnam (1954-1975): An economic dimension.	Other Social Sciences (7) History (8.1)	65 (2)	93
23	Phuong Chi Pham	Stories of the Indian descendants as revolutionaries in Vietnam.	Other History and Archaeology (8.3) Literary Studies (9.2)	65 (2)	107
24	Tinh Vy Tran, Duc Lam Thao Nguyen	Trauma, sexuality, and identity in <i>The Lover</i> by Marguerite Duras and <i>Burning Grass on The Field</i> by Doan Minh Phuong.	Literary Studies (9.2)	65 (2)	117
25	Nguyen Quynh Huong, Nguyen Vu Hao	National character in the view of psychoanalysis.	Developmental Psychology (1.1)	65 (3)	3
26	Nguyen Van Quang, Thai Thanh Binh, Ngo The Anh	Mariculture development in Vietnam: Present status and prospects.	Economics (2.1) Business and Management (2.2)	65 (3)	11
27	Nguyen Thi Thuy, Tran Dinh Thao, Tran Thi Thuong, Dinh Cao Khue, Dinh Gia Nghia	Fruit and vegetable consumer preferences of Japanese and Vietnam's export potential.	Economics (2.1) Sociology (4.1)	65 (3)	21
28	Xuan Sinh Le, Van Bach Nguyen, Thi Minh Hien Bui, Manh Hao Do, Van Thao Nguyen, Thi Thu Ha Nguyen, Van Tung Pham, Truong Huynh Nguyen	Green economic model adapting to climate change and disaster prevention in Bach Long Vi island district, Hai Phong city.	Economics (2.1) International Relations (5.2)	65 (3)	31
29	Hung Anh Nguyen, Quoc Viet Tran, Xuan Manh Trinh, Duc Quy Luong	Application of decision analysis module in water resources allocation of inter-provincial river basins: A case study at the Bang Giang - Ky Cung river basin, Vietnam.	Economics (2.1) Other Social Sciences (7)	65 (3)	42
30	Wil Martens, Diu Thi Huong Pham, Justin Matthew Pang	A computational approach to transparency in corporate governance across borders.	Business and Management (2.2)	65 (3)	51
31	Tran Thi My Phuong, Phan Anh Tu	A model of entrepreneurial intention of graduates in the Mekong river delta.	Business and Management (2.2)	65 (3)	66
32	Tran Son Ninh, Tran Doan Hieu, Pham Thi Hoai Thu	Smart factories: Literature review and development prospects.	Business and Management (2.2)	65 (3)	76
33	Huynh Thi Trang, Nguyen Huynh Mai, Huynh Nhat Duyen	Librarians' professional development needs in the digital age - A case study at the Learning Resource Centre - Can Tho University, Vietnam.	Curriculum and Pedagogy (3.2)	65 (3)	82
34	Tran Minh Hieu, Nguyen Thanh Vinh, Le Thi Ngoc Chuc, Nguyen Ngoc Thao Ngan, Phan Thanh Loc	Factors affecting students' learning outcomes at the Faculty of Economics and Business Administration An Giang University.	Specialist Studies in Education (3.3) Other Education (3.4)	65 (3)	89
35	Hong Anh Do, Thanh Vinh Pham, Thi Thao Van Le, Tuan Minh Vu, Tuan Luong Truong, Trung Hieu Nguyen, Thi Thuy Lan Le, Van Khanh Do, Thi Sanh Le	ASEAN's soft law on marine environmental pollution.	Jurisprudence (6)	65 (3)	99
36	Huynh Van Da, Truong Thi Kim Thuy, Dao Vu Huong Giang, Tran Trung Kien	Sustainable tourism development and potential implications for the tourism sector in the Vietnamese Mekong delta in the context of climate change.	Other Social Sciences (7)	65 (3)	109
37	Thi Van Anh Ho, Thanh Nga Le	Revealing the invisible: A phenomenological reading of N.B. Phuong's <i>The Absent</i> (1999) and W. Faulkner's <i>As I Lay Dying</i> (1930)	Literary Studies (9.2)	65 (3)	120

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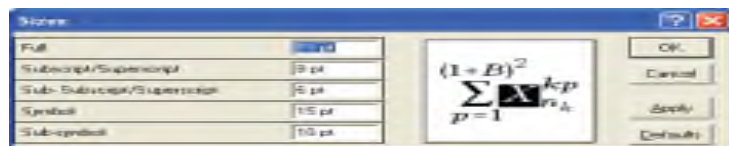


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g				
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Equations

$$\int_a^b x dx \quad (1)$$

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[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.

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