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Research Article

Cai Rang Floating Market: The Dual Impacts of Urbanization and Climate Change on Livelihoods, Infrastructure, and Cultural Space

Thoa Thi Kim Phan^{1*}, Trang Thi Thuy Nguyen²

¹ Faculty of Civil Engineering, Ho Chi Minh City University of Technology and Education, 1 Vo Van Ngan, Ho Chi Minh City, Vietnam;

² Faculty of Architecture, Da Nang University of Architecture, 566 Nui Thanh, Da Nang City, Vietnam

* Correspondence: 21157126@student.hcmute.edu.vn

Abstract: This study analyzes the dual impacts of urbanization and climate change on livelihoods and cultural space at the Cai Rang floating market, an intangible cultural heritage site in Vietnam. The research employs a qualitative approach, drawing on secondary sources and visual data to clarify the relationships among infrastructure, spatial organization, and livelihoods. The results indicate that the “river embankment” project, a climate change adaptation measure, directly disrupted the architectural structure of the “two-access house,” causing spatial fragmentation and reducing the number of trading boats by 50% to 60%. This change forced the community to undergo a compulsory livelihood transition, shifting from wholesale agricultural trade to tourism-oriented retail services. The study emphasizes that infrastructure development policies need to be harmonized with cultural preservation objectives to ensure a sustainable development strategy that both protects the community from the impacts of climate change and preserves the core cultural and livelihood values of the heritage site.

Keywords: Cai Rang floating market; Urbanization; Climate change; Technical infrastructure; Sustainable livelihoods; Cultural space.

Highlights:

- Analysis of floating market livelihoods adapting to urbanization and climate change pressures.
- Emphasizing the role of cultural heritage in building resilient riverside communities.
- Proposing community-based climate adaptation planning solutions.

1. Introduction

Floating markets are distinctive socio-economic and cultural institutions of local communities, formed under the unique natural and hydrological conditions of their regions. With a dense network of rivers and canals, waterway transport used to be the primary means of mobility, creating the foundation for the emergence of floating markets. These spaces not only serve as centers of goods exchange but also play a vital role in tourism development, reflecting the cultural life, customs, and indigenous knowledge of riverine communities. However, in recent decades, the vitality of floating markets in general, and Cai Rang in particular, has significantly declined in both scale and function. The rapid expansion of road networks,

the rise of supermarkets and shopping centers on land, and changes in consumption habits have greatly diminished their traditional economic role. Globally, other floating markets such as Damnoen Saduak (Thailand), Lok Baintan (Indonesia, Borneo), and Talingchan (Chotiwon, 2006) are facing similar challenges: inadequate infrastructure, environmental pollution, over-commercialization, and the weakening of indigenous community roles.

In particular, the Cai Rang Floating Market is under dual pressure from climate change and the rapid urbanization of Can Tho. This has led to a decline in the number of trading boats, a shrinking volume of trade, and a gradual shift of the market from a livelihood space to a tourist attraction. This process of commercialization creates both opportunities for tourism-driven economic growth and tensions in the management, preservation, and maintenance of the market's original socio-cultural values, while also undermining the role of the local community. According to the document "Adjustment of the master plan for tourism development of Can Tho City until 2020, with orientations toward 2030" (UBNDTp.CanTho, 2016), the state has introduced specific strategies for Can Tho's tourism development. Floating market tourism is envisioned as an essential experience for visitors to Can Tho City; however, the development of this tourism model remains limited. Policies appear to be the key factor determining whether tourism development succeeds or stagnates, depending on how realistic they are in the local context.

Studies on Cai Rang Floating Market after 2015 have mainly focused on tourism and socio-cultural dimensions, emphasizing the potential for ecotourism development, cultural preservation, and enhancement of visitor experience. For example, the article "Factors affecting the development of floating market tourism in Can Tho City and its surrounding areas" (Nhan, 2019) provides a robust quantitative framework identifying seven service-related factors as the main influences on floating market tourism. The study highlights that weaknesses in infrastructure and management are major challenges. However, the data are outdated and lack in-depth analysis of emerging factors such as digital technology, climate change, and urbanization, limiting the practical applicability of the framework in the current context. The study sensibly recommends that policymakers prioritize cultural and community factors and the riverine environment alongside basic service improvements. Similarly, the paper "Factors affecting the service quality of Cai Rang Floating Market tourism, Can Tho City" (Phan & Phan, 2016) provides an in-depth analysis of service quality using a quantitative SERVPERF-based model. It identifies culture (the market's uniqueness) and the responsiveness and empathy of local residents as the strongest determinants of visitor satisfaction. While emphasizing cultural appeal as a key driver, the study also points out that water pollution and poor infrastructure are major obstacles to the tourism experience. This contradiction implies that although the market's cultural value attracts tourists, environmental degradation directly threatens the sustainability of that experience. The authors recommend prioritizing the preservation of core cultural values, strengthening community capacity, and improving environmental sanitation to promote sustainable tourism development.

Overall, existing studies consistently highlight the central role of culture and the river community while warning that environmental and infrastructural problems are the most significant barriers. However, they lack deeper analysis of the floating market's spatial architecture, supporting infrastructure, sustainable management mechanisms, and the long-term impacts of climate change. In this context, analyzing the combined impacts of climate change and urbanization on the natural conditions, waterway infrastructure, and livelihoods of the Cai Rang Floating Market community is essential. This study seeks to fill that gap and holds strong practical significance, supporting ongoing planning projects in Can Tho Province, particularly within the framework of the Tourism Development Plan for Can Tho for the period 2020 to 2030. Therefore, this research aims to comprehensively analyze the dual impacts of urbanization and climate change on three core aspects: (1) the livelihoods of the riverine trading community, (2) the technical infrastructure of the market, and (3) the cultural space of the Cai Rang Floating Market. From this foundation, the study proposes interdisciplinary and sustainable strategies to help the community adapt and preserve this unique heritage value.

2. Literature Review

Floating markets are a traditional form of commerce that appear widely across the world, especially in delta regions where river systems play a central role in the economic and social life of local communities. From the Damnoen Saduak and Amphawa floating markets in Thailand to those in Bangkok, Pattaya, Lok Baintan in Indonesia, and the Tonle Sap floating market in Cambodia, the river-based trading model illustrates

communities' adaptive relationship with hydrological conditions. International studies have recognized that floating markets are not only spaces for the exchange of goods but also important cultural tourism destinations. However, they now face significant challenges: declining sources of goods due to agricultural transformation, pressures from urbanization and the rise of modern retail systems, and escalating risks of climate change such as flooding, drought, and sea-level rise.

In Vietnam, numerous academic studies and practical reports have examined the cultural significance and tourism potential of Cai Rang Floating Market. For instance, the paper "The Development of Cai Rang Floating Market Tourism in Can Tho" (Phuong, 2017) provides a comprehensive and insightful analysis of the market's transformation. The study positions the market as a cultural symbol of the riverine lifestyle, while tracing its shift from a traditional agricultural trading hub to a tourist destination. Importantly, it identifies the market's positive socio-economic contributions, such as job creation, income generation, and tourism promotion for Can Tho City, while also warning of internal vulnerabilities threatening its long-term sustainability. These include the decline in boat numbers, urbanization pressures, environmental pollution, and the risks of excessive commercialization that erode authenticity and cultural integrity. The paper thus serves as a crucial warning for a balanced tourism development strategy that harmonizes livelihood preservation with heritage conservation.

From a broader perspective, Chau and Tran (2025), in their article "Between Livelihood and Heritage: The Future of Floating Markets in the Mekong Delta," focus on the relationship between livelihoods and climate change. The authors argue that the decline of river-based trading is not only driven by competition from land-based markets and changes in agricultural supply chains but is also deeply influenced by environmental factors such as floods, droughts, and water-level fluctuations. Moreover, the paper critically points out governance shortcomings, where tourism and urban development policies often prioritize economic growth over community resilience and sustainability. This study thus calls for a comprehensive strategy in which heritage conservation is coupled with livelihood support and socio-ecological adaptation to ensure the survival of floating markets under increasing climate stress in the Mekong Delta.

Complementing this, the research "A Study of Cai Rang Floating Market Towards Tourists' Satisfaction" (Trinh, 2018) takes a tourist-experience perspective, identifying factors such as tour guides, transportation, infrastructure, and service quality as key determinants of visitor satisfaction. However, the study lacks a deeper exploration of socio-cultural dimensions, potentially leading to an overemphasis on commercialized service improvement while neglecting tensions between tourism demand and the preservation of authentic riverine livelihoods. Hence, while the study is useful for service quality management, it needs to be supplemented by cultural- and heritage-focused analyses to ensure responsible and sustainable tourism development. Similarly, the domestic research "Preserving and Promoting the Cultural Values of Cai Rang Floating Market in the Tourism Activities of Can Tho City" (Van, 2021) highlights the importance of preserving and promoting the market's cultural value through five key dimensions: product development, communication and promotion, capital resources, cooperation, and environmental management. Yet, most domestic studies remain at the level of proposing tourism management or cultural preservation measures, without delving into the systemic interconnections between climate change, urban infrastructure development, and traditional livelihoods, which are three interdependent pillars determining the survival of the floating market. This research gap underscores the urgent need for interdisciplinary studies in the future, integrating architecture, hydrology, and social sciences to formulate more sustainable and effective conservation strategies in the context of the rapidly transforming Mekong Delta.

Meanwhile, international studies have approached the Cai Rang Floating Market from a broader perspective, viewing it through the lens of the informal economy and sustainable urban development. Comparative research on other floating markets in Southeast Asia, such as Damnoen Saduak in Thailand, exemplified by the article "Damnoen Saduak Floating Market: The Construction of Floating Market Community Identity from Agricultural Society to Tourism Community" (Thongpanya, 2018), reveals a common trend: floating markets are transitioning from traditional trading spaces to tourism-oriented destinations. This shift has led to a decline in livelihood stability and poses risks to the preservation of cultural identity.

In addition, several key international studies, such as Cohen's (2016) "The Permutations of Thailand's 'Floating Markets,'" have highlighted how urbanization and tourism development have profoundly transformed the spatial functions and socio-economic roles of floating markets. Originally, Thailand's floating markets operated as networks for agricultural trade integrated with canal systems. However, as road

infrastructure expanded, many markets declined, only to be later revived or reconstructed for tourism purposes. In these newly created or revitalized markets, traditional boat-based trading has increasingly been replaced by food services, entertainment, and souvenir sales, often accompanied by modern infrastructure designed to attract tourists.

While these changes generate economic growth opportunities, they also heighten community vulnerability. Local livelihoods have become heavily dependent on tourist flows, while infrastructure development is often prioritized for commercial and tourism goals rather than long-term resilience against environmental fluctuations and climate risks. These international perspectives are particularly relevant to Cai Rang Floating Market, as they serve as a warning about the potential pitfalls of commercialization and functional transformation. Cai Rang is currently undergoing similar livelihood shifts and urban infrastructure pressures. Consequently, these studies underscore the need for multi-stakeholder governance integrating the state, local communities, and private enterprises to ensure both heritage preservation and climate resilience.

Overall, research in Vietnam has primarily focused on affirming the cultural value and tourism potential of floating markets, particularly the Cai Rang Floating Market. Most domestic studies highlight their role as symbols of riverine culture and assess their socio-economic impacts through tourism activities. However, they often stop at recommending heritage conservation or tourism management solutions. In contrast, international research treats floating markets as broader socio-cultural phenomena, analyzing community identity reconstruction, spatial typologies, and especially the relationships between climate change, livelihoods, and urbanization pressures. The key research gap that Vietnam, especially regarding Cai Rang Floating Market, must address lies in the absence of an integrated conceptual framework that interconnects culture, infrastructure, and climate resilience. Future research needs to explore these systemic interrelationships more deeply to propose comprehensive strategies that both preserve cultural values and enhance local adaptive capacity amid rapid urbanization.

3. Materials and Methods

3.1. Research methods

This study employs a mixed-methods approach, combining qualitative and quantitative methods to provide a comprehensive assessment of the current status of the Cai Rang Floating Market in the context of climate change and urbanization. The research methods are implemented through the following specific steps.

3.1.1. Field research method

Fieldwork was conducted directly in the Cai Rang Floating Market area in two main phases to capture hydrological variations and compare seasonal economic activities, ensuring the comprehensiveness of the data.

Phase 1 (flood season/rainy season): A three-day survey was conducted from October 1–3, 2024, focusing on the impacts of rising water levels on spatial adjustments in trading and anchoring. Special attention was given to assessing the pressure on technical infrastructure due to the increased influx of tourists during the rainy/festival season.

Phase 2 (dry season/low-water period): A one-week survey was conducted from May 16–22, 2025, focusing on the effects of low water levels and saltwater intrusion on the agricultural supply chain. The study also observed the deterioration of water quality and the impacts of hard embankment construction on the “dual-access typology” of riverside housing structures.

Data collection activities: Observation and field notes: Participatory observation was conducted by joining traders on boats to document trading activities and record spatial changes caused by infrastructural interventions and environmental variations.

Structural data collection: On-site documentation included field sketches of market spatial organization and photographic records of riverside housing, trading activities, and goods exchange.

Data analysis: Field images and notes were coded and categorized by thematic groups (e.g., infrastructure and waterway circulation, water quality degradation and pollution, trading activities) to support spatial structure analysis, landscape transformation assessment, and identification of indicators related to livelihood decline.

3.1.2. Semi - structured interviews

Approximately 15 interviews were conducted with key groups, including long-term boat traders and vendors operating at the floating market, to understand trading practices, adaptation to environmental and infrastructural changes, and their personal perceptions of the market's cultural and social values. Interviews were also carried out with local residents (households living along the river or indirectly involved in market activities) to collect data on livelihoods, occupational transitions, and everyday life connected to the market. The interview questions focused on three main themes: (1) cultural memory and perceptions of the heritage value of the floating market; (2) trading practices, livelihoods, and changes under the impacts of climate change and urbanization; and (3) community expectations and proposals for the conservation and sustainable development of the Cai Rang Floating Market (Table 1).

Table 1. Demographic characteristics of interview participants

Demographic characteristics	Quantity	Occupation/Role	Age
Semi - structured interviewees	15	8 long - term boat traders/small merchants, 5 residents/ service participants, and 2 management officials.	30 - 65

3.2. Overview of Cai Rang Floating Market

3.2.1. Cai Rang Floating Market

Cai Rang Floating Market was recognized by the Ministry of Culture, Sports and Tourism as a national intangible cultural heritage site in 2016. The market was formed in the early twentieth century, closely linked to the process of land reclamation and the development of trade in the lower Hau River region (Hung, 2007). Initially, it was located near Cai Rang Bridge, but in the early 1990s, due to obstructions to waterway traffic, it was relocated toward Phong Dien, approximately one kilometre from its original position (Phan & Phan, 2016). Cai Rang Floating Market is situated about 6 km from downtown Can Tho City along the Hau River-Xa No Canal trade route, which provides convenient access for trading with nearby provinces and across the Mekong Delta region (Figure 1).

The market operates from early dawn, with trading activities beginning around 2–3 a.m., when boats from various regions gather to purchase goods for redistribution. The vibrant atmosphere continues until around 7–8 a.m., then gradually quiets down by 9 a.m. The market pauses operations only during major holidays such as Lunar New Year or the Double Fifth Festival (Hung, 2019).

Bustling interactions take place among various types of boats, from small rowing boats to motorized vessels, reflecting the adaptability and sophisticated navigation skills of riverine inhabitants. The “beo hang” culture represents a unique advertising and trading method that has become a hallmark of Cai Rang Floating Market. In the vast expanse of waterways, where the sounds of boat engines drown out verbal calls, traders have devised an ingenious communication method: erecting a tall bamboo pole, known as a “cay beo,” at the bow of the boat and hanging samples of the goods they sell.

This practice embodies the “Four Hanging Codes,” a nuanced system understood intuitively by locals that helps buyers easily identify sellers: “hang what you sell” (traders display the items they sell so customers can recognize and approach them); “sell without hanging” (small boats selling food and drinks to visitors and residents without hanging any goods); “hang but do not sell” (the boat is a living space rather than a trading one, so clothes or household items may be hung); and “hang one thing, sell another” (for example, hanging palm leaves or roofing material to signal that the boat itself is for sale). The “cay beo” is not merely a functional communication tool but also a symbol of the refinement and charm embedded in water-based culture, contributing to the distinctive and lively identity of Cai Rang Floating Market (Vinpearl, 2024).



Figure 1. Location and brief image of Cai Rang Floating Market.

3.2.2. Spatial Structure and Traditional Functional Zoning

Unlike land-based markets, the Cai Rang Floating Market is not divided into fixed zones according to administrative planning. Instead, it is naturally organized based on the types of activities and goods traded, forming three main areas: the main trading zone, the retail and food service zone, and the tourism service zone. The main trading zone is located in the central section, the core living and trading space of the river merchants. The primary activities here involve wholesale trading of agricultural products. This area represents the most authentic, bustling, and historically rooted part of the market, where large trading boats are moored closely together. Visitors to this area can observe the iconic “cay beo” (bamboo poles displaying goods as advertisements) and the unique practice of throw-and-catch trading between boats.

At the upper section of the market, a group of river traders has adapted to the tourism economy. Tourist boats from Ninh Kieu Wharf and other docks bring visitors to explore the market. This area mainly accommodates tourism-related services, such as transportation, guiding, and on-boat experiences for tourists. The retail and food service zone is interwoven with, or located toward the end of, the main market. It consists of small boats and canoes providing food, beverages, and daily necessities for both locals and tourists. This area plays a vital role in shaping the market’s distinctive cultural identity, blending everyday life with tourism. Understanding this traditional functional structure is essential for analyzing landscape transformations and guiding conservation policies, ensuring that the authenticity and cultural integrity of the floating market are preserved amid tourism development.

4. Results

4.1. Impact on natural conditions and infrastructure

4.1.1. Spatial dispersion and decline in crowdedness

The project “Riverbank Embankment – Climate Change Adaptation in Can Tho City” is a major infrastructure intervention that plays an important role in protecting both physical assets and residents from the impacts of climate change. However, the construction and upgrading of the embankment have had direct physical impacts, eroding the market’s vibrancy and dispersing the core trading space of Cai Rang Floating Market. Before 2023 (Figure 2a), the market maintained a high degree of concentration in the main trading zone, where large cargo boats were moored closely together and riverfront warehouses and households remained active in wholesale trading. This created the bustling and distinctive image of the heritage site.

The implementation of the riverbank embankment, with sections rising 3–4 meters above the boat decks (Figure 3), has created a physical barrier that cuts off river access for riverside warehouses. Figures 2b and 2c clearly illustrate the clearance and relocation of riverside households and transfer depots. As a result, the water-to-land supply chain has been disrupted, depriving large wholesale boats of mooring points and centralized gathering spaces. Consequently, trading activities have been forced to disperse into tributary canals or more distant areas, significantly shrinking the core trading space.

The ultimate outcome has been a marked decline in the market’s vibrancy (Figure 2c). The number of boats operating regularly has sharply decreased (estimated at 50%–60%) (Nhan, 2024), transforming the floating market from a bustling commercial hub into a sparse and fragmented space, increasingly dominated by small-scale services catering to tourism. This provides clear evidence that hard infrastructure has disrupted the natural spatial organization of the floating market.

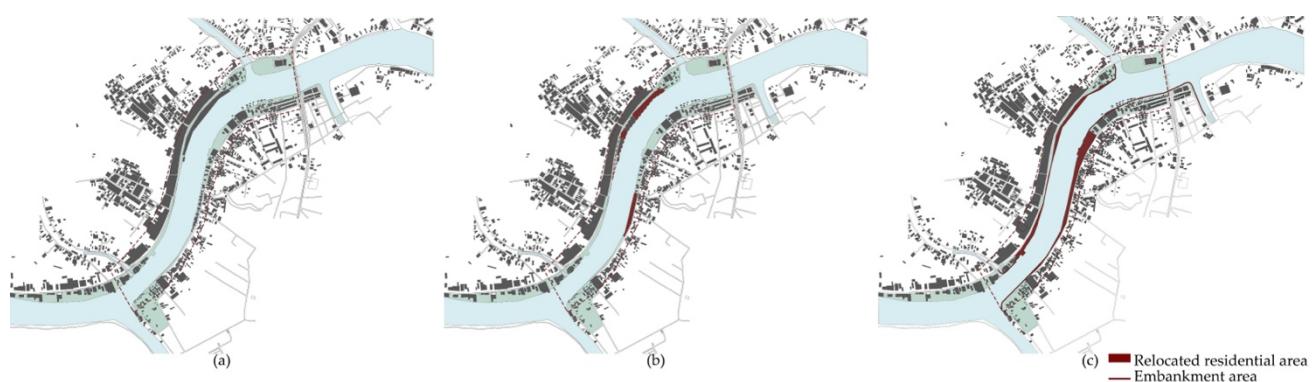


Figure 2. Changes in the population of the area before 2023 (a), in 2023 (b), and in 2025 (c).



Figure 3. Infrastructure and waterway transportation.

4.1.2. Disruption of the ‘Two-Access’ Architectural Structure

The architectural feature of the “two-access house” is an inseparable cultural and ecological characteristic of the area surrounding the Cai Rang floating market, representing the ingenious adaptation of residents to the traditional “wharf above, boats below” model. Essentially, this structure functions as a dual economic linkage: waterway access allows the house to operate as a warehouse receiving agricultural products directly from boats at the floating market, while road access serves the distribution of goods and the development of urban services.

However, the implementation of riverbank embankment projects for climate change adaptation has introduced hardened technical dikes, severely disrupting this structure. The embankments, built too high, have eliminated traditional river access, stripping riverside houses of their role as transfer hubs. This has led directly to two consequences: first, households displaced by embankment construction were forced to relocate to government-planned resettlement areas; second, many remaining warehouse owners, having lost their economic function, moved further inland or fully shifted to purely urban business models, thereby reducing the scale of and dispersing the boat trading community and eroding this important architectural and cultural identity.

4.1.3. Water quality deterioration and pollution

4.1.3.1. Water Quality Degradation

Currently, the Cai Rang Floating Market is facing serious water quality degradation and pollution (Figure 4). The root causes stem from rapid urbanization, population growth, and expanding tourism activities, while wastewater and solid waste management systems remain ineffective. Domestic waste, combined with large volumes of garbage generated from trading and tourism activities on the river, is discharged directly into the Can Tho River. This pollution not only poses risks to hygiene and food safety in trading activities but also diminishes the visual appeal of the floating market, eroding its inherent charm and attractiveness.



Figure 4. Declining water quality and pollution

4.1.3.2. Limitations in Tourism Infrastructure

The environmental problems have been further exacerbated by the lack of synchronized service infrastructure and the insufficient capacity to cope with climate change. Although there have been efforts to construct tourism facilities such as public restrooms and tourist piers, the progress and level of completion remain inadequate to meet the actual needs of both local traders and visitors. The shortage of essential amenities not only hinders daily activities and business operations but also increases direct waste discharge into the river environment. This creates a negative feedback loop: urbanization leads to pollution, which strains technical infrastructure, ultimately resulting in the degradation of cultural heritage and a reduced adaptive capacity of the community.

4.2. Impact on the Livelihood of the Merchant Community

4.2.1. Functional Displacement and Forced Livelihood Conversion

In contrast to the decline of traditional trading activities, data from the Department of Culture, Sports, and Tourism (2024) indicate a rapid increase in tourism in Can Tho, with over 6.37 million visitors and total revenue of VND 6,269 billion, achieving 105% of the 2024 annual target (Bien, 2025). This trend reflects a functional shift of the Cai Rang Floating Market from a traditional commercial hub to a cultural performance space catering primarily to tourism.

Interviews with local residents reveal that this transformation has deeply affected livelihoods. An elderly boat trader shared: *"I used to sell fruits at the market, but I gave up the job I had done for 10 years to open a homestay for tourists and offer river tours. The business is relatively good, especially from May to August and from November to February. Meanwhile, many younger households have followed the government's relocation program and moved ashore to find new livelihoods. In contrast, older traders who are accustomed to living on boats tend to remain, though as their health declines, they stop trading because adapting to life on land is difficult."* Similarly, Ms. Sau, a boatwoman, noted: *"I*

take tourists on morning boat trips and return to my small government-issued house along the embankment in the evening. My income now depends almost entirely on the number of tourists visiting the market each day."

These narratives illustrate the increasing dependence of local livelihoods on tourism flows. As traditional river-based trading contracts, traders' revenues have declined and sustaining floating livelihoods has become increasingly difficult. Under such pressure, many households have shifted toward service-based economies, particularly tourism-related activities such as selling souvenirs and food or organizing experiential tours (Figure 5). However, this transition entails significant risks and costs, including boat operation and maintenance expenses, seasonal fluctuations in visitor numbers, and the potential loss of income due to adverse weather or environmental changes. Consequently, traditional livelihoods are being gradually eroded, compelling the community to adapt to new economic models amid rapid urbanization and climate change.



Figure 5. Image of traders' commercial activities at the floating market.

At present, the daily life of residents at the Cai Rang Floating Market (Figure 6) continues but has become increasingly constrained and transformed under the influence of infrastructure development and environmental change. The construction of the river embankment has created a physical barrier, isolating the remaining riverside households from direct access to the water and disrupting water-dependent activities such as washing, collecting water, and interacting with passing boats. For low-income households living on plots lower than the new embankment level, everyday life has become particularly inconvenient, as residents must climb steep stairways to reach the river, posing both physical strain and safety risks. At the same time, deteriorating water quality has further reduced living conditions and increased health risks. Moreover, the dispersion of boats and the shift toward tourism-based businesses have weakened traditional social cohesion among floating traders. Consequently, the daily life of floating market residents now reflects a disrupted way of living, burdened by economic vulnerability, environmental degradation, and the socio-spatial impacts of urbanization.



Figure 6. Images of local residents' daily activities.

4.2.2. Economic Differentiation and Adaptation Burden

Households located along the embankment have had to find their own ways to adapt, facing increasing socio-economic differentiation resulting from infrastructural interventions. Families with sufficient financial capacity have raised and renovated their houses to match the height of the new embankment road, incurring substantial costs to maintain their physical and social connection to the urban fabric. In contrast, low-income households, unable to afford such upgrades, are forced to live at lower ground levels and rely on makeshift wooden stairways to reach the embankment due to the height difference. This situation not only causes inconvenience and risks such as localized flooding and sanitation issues but also fosters a sense of disconnection and isolation, as these households feel left behind in the city's development process. Ultimately, this condition reflects spatial and social inequality in access to urban living environments, where the very climate adaptation infrastructure intended to protect the city has paradoxically imposed economic and social burdens on the most vulnerable communities (Figure 7).



Figure 7. Households located adjacent to the embankment area.

4.3. Community Adaptation and the Development of Experiential Tourism in the Cai Rang Floating Market.

For the floating trader community at the Cai Rang Floating Market, trading is regarded as an inseparable part of their cultural and communal identity, extending far beyond its economic meaning. River networks such as the Can Tho River, Xang Canal, and Cai Rang Canal have long been seen as symbols of space, livelihood, and culture, deeply intertwined with the riverine lifestyle and settlement traditions of residents. In the face of the dual challenges of urbanization and climate change, a generational conflict of values has emerged. The greatest concern lies in the gradual disappearance of traditional trading practices. The older generation wishes to preserve and revitalize the market's historical and cultural significance, calling for greater involvement from both the government and the local community. In contrast, younger workers show less interest in continuing the trade due to unstable income and modernization pressures, resulting in outmigration and occupational shifts to onshore industries.

Nevertheless, the community has sought to adapt through the promotion of community-based and experiential tourism, including river tours, hands-on workshops, and cultural experiences, viewing these as pathways to both preserve traditions and generate livelihoods. However, this adaptive process still faces sustainability challenges, particularly concerning environmental impacts. Increasing concerns about water pollution and wastewater discharge from daily life and trade activities highlight the urgent need for integrated technical and environmental management solutions to protect public health and the aesthetic and heritage values of the market, thereby maintaining its attractiveness to visitors (Table 2).

Community-led innovations have demonstrated the adaptive capacity and resilience of the floating market. Several households have improved their boats, adopted better preservation techniques, and implemented more efficient trading methods to reduce labour and increase productivity. Alongside these technical innovations, cultural and heritage tourism has grown rapidly. Visitors' interest in the floating market's landscape, riverine lifestyle, and traders' personal stories has opened new opportunities for the local economy through craft-making, culinary experiences, and cultural interpretation. These efforts form a solid foundation for a sustainable development model that both respects and revitalizes the core cultural values of the floating market.

Table 2. Main concerns of residents

Topic of concern	Content
Cultural and heritage preservation	Local people wish to maintain the image of the traditional floating market, especially wholesale agricultural trade and distinctive features such as the "cay beo" (hanging poles displaying goods).
Livelihoods and income	The boat-trading community worries about unstable income when shifting from wholesale trading to retail tourism services. Many have had to change jobs or relocate.
Community tourism	There is a desire to develop craft-village tourism to generate additional income (organizing tours, workshops on making noodles, handicrafts, etc.).
Infrastructure and environment	Locals are concerned about water pollution and the lack of service infrastructure (such as public toilets).

5. Discussion

5.1. International Comparison: Functional Transition and Vulnerability

The functional transformation of Cai Rang Floating Market from an agricultural trading hub into a cultural and tourism space shows notable similarities with Thailand's famous Damnoen Saduak Floating Market. Both markets have undergone structural transitions driven by economic and infrastructural development. According to international studies, Damnoen Saduak has experienced three main phases: 1868 to 1967, "local farming communities living and trading along the river"; 1967 to 1977, "floating market community serving tourism"; and 1977 to the present, "commercialized, tourism oriented floating communities" (Thongpanya, 2018). Similarly, Cai Rang is currently in its second transitional phase, in which it still maintains agricultural trading, though sharply declining, while increasingly catering to tourism. The shared causes of this functional shift include the expansion of road networks, changing socio-economic models, evolving policies, and a strategic orientation toward tourism development.

However, the core distinction of Cai Rang lies in its dual exposure to urbanization and climate change. Hard engineered infrastructure, such as river embankment systems constructed to mitigate erosion and rising water levels, has unintentionally disrupted the traditional spatial structure of the floating market. The amphibious lifestyle of riverbank households is disappearing, breaking the continuum between living spaces, trading zones, and hydrological flows. The livelihoods of floating traders, once sustained by waterborne agricultural exchange networks, have been severely weakened. This economic precarity is evident in the words of a local trader: "We can only earn enough during the peak tourist season. The rest of the year is a struggle for survival." While tourism based economic models have emerged as alternatives, the living environment remains at risk due to inadequate waste and wastewater management systems, leading to worsening pollution.

Cai Rang thus represents a typical case of tension between climate adaptation measures and the preservation of traditional cultural identity. Rather than a smooth restructuring toward tourism markets, the floating trader community is undergoing a fragile and vulnerable transformation. Each infrastructural intervention, policy change, and environmental fluctuation simultaneously affects the spatial, economic, and cultural fabric of the market. Analyzing these dual impacts is essential for developing adaptive and sustainable conservation strategies that balance heritage preservation with climate resilience.

5.2. Comprehensive Solution: Digital Communication, Community Education, and Branding

The integration of the strategic framework of digital communication, community education, and brand building is an essential approach to revitalizing and enhancing both the cultural and economic values of the Cai Rang Floating Market. Digital communication plays a vital role in promoting the market's image and narrating its riverine cultural heritage through social media, websites, and digital tourism platforms. This approach can draw inspiration from successful tourism campaigns such as "Amazing Thailand", where digital storytelling and influencer engagement are used to convey cultural narratives and create strong appeal among international visitors and younger generations. Furthermore, the digitization of images and heritage stories provides valuable support for preserving traditional knowledge and cultural practices (Duc & Van Tien, 2025), helping to safeguard trading customs that are gradually fading. Thus, digital communication is not merely a marketing tool but also a technological bridge that connects, preserves, and revitalizes the heritage of Cai Rang in the modern era.

At the same time, community education is a key factor in ensuring the sustainability of this heritage. These initiatives aim to raise awareness and improve the skills of local vendors and residents in cultural preservation, sanitation, and environmental protection. They also help younger generations understand and appreciate the essential role of the floating market in the cultural and economic life of the Mekong Delta.

Finally, brand building for Cai Rang Floating Market requires a structured strategic approach, similar to the Brand Canvas model applied at Hua Takhe Market in Thailand (Intuluck et al., 2025), in order to transform cultural assets into sustainable market value. The core of this strategy lies in a dual positioning: Cai Rang should be redefined not merely as a market but as a "living heritage – center of Mekong riverine trade". This approach helps both to preserve and to highlight its unique cultural identity, such as the "beo hang" (hanging product sign) tradition, boat-based cuisine, and riverine lifestyle elements that have proven to be strong cultural brand assets attracting domestic and international visitors. More importantly, the branding process should follow a bottom-up approach, empowering the local floating community as heritage keepers and brand ambassadors. Applying this integrated strategic framework will help Cai Rang avoid the risk of complete commercialization,

as seen in the case of the Damnoen Saduak Floating Market, and instead foster a strong, community-centered brand that promotes both heritage conservation and sustainable livelihoods.

5.3. Research Gaps and Policy Directions

Studies on the Cai Rang Floating Market conducted after 2015 have generally continued to focus on its economic and tourism dimensions, while giving insufficient attention to the architectural and infrastructural consequences along the riverfront, as well as the long-term impacts of climate change on the market's spatial and socio-ecological systems. There remains a notable absence of quantitative and spatially grounded research, such as surveys, GIS mapping, and spatial analyses, that could track shifts in residential patterns and the livelihoods of the floating trading community. Such data are fundamental to assessing levels of social and ecological vulnerability within the broader context of riverside urbanization. Moreover, the lack of interdisciplinary approaches linking architecture, hydrology, and sociology has limited the comprehensiveness of existing research. This has led to the risk of what can be termed "surface conservation", focusing primarily on visual or touristic preservation while neglecting the structural degradation of space and the erosion of community livelihoods.

From these research gaps, urban planning and policy frameworks should be reoriented toward achieving a balance between cultural preservation, livelihood maintenance, and climate resilience. Applying Cohen's (2016) classification framework could help reposition the Cai Rang Floating Market not merely as a cultural tourism model but also as an exemplar of riverside community adaptation to climate change. To avoid "surface conservation", future projects should prioritize soft infrastructure and social equity. This includes implementing environmentally friendly infrastructure such as floating toilets, waste collection and water treatment systems, and investing in livelihood-support facilities like piers for wholesale boats, flexible docking spaces, and flood-season safety measures. At the same time, social policies must support vulnerable households in adapting to infrastructural upgrades, mitigating inequalities that arise from disparities in elevation (for example, homes lower than embankments). In this way, long-term policy directions would not only sustain the cultural and economic value of the floating market but also enhance community resilience and reduce vulnerabilities in the face of urbanization and climate change.

6. Conclusions

Cai Rang Floating Market is not only a distinctive hub for the trading of agricultural products but also a living cultural space that deeply reflects the riverine identity of the Mekong Delta. However, under the pressures of rapid urbanization, intensifying climate change, and shifting socioeconomic demands, this heritage site is at risk of gradual disappearance if comprehensive and sustainable strategies are not implemented.

This study clarifies the spatial and cultural components of the floating market, emphasizing the fragile interconnections between riverine architecture, hard infrastructure, the livelihoods of floating traders, and community culture. It proposes a repositioning of the market's spatial identity, based on Cohen's (2016) classification, toward a hybrid economic-cultural space where traditional trade activities coexist with cultural performances and experiential tourism. Cai Rang therefore has the potential to become a model of climate-adaptive riverside community development, laying the foundation for sustainable urbanization in river-based settlements.

To transform Cai Rang Floating Market from a vulnerable heritage space into a resilient and sustainable model, an integrated and coordinated set of solutions must be adopted. The core strategies include:

- Policy and infrastructure: implement a comprehensive long-term master plan that harmonizes hard and soft infrastructure, while establishing a conservation alliance with regulatory frameworks for riverfront architecture and infrastructure across the Mekong Delta.
- Culture and human resources: promote digitization and media communication to represent and revitalize the market's heritage identity (in the short term), while developing human capital associated with community-based tourism and traditional livelihoods.
- Brand development: build a "climate-resilient floating market" brand to affirm its unique regional identity and long-term sustainability.

This transformation requires interdisciplinary collaboration among government bodies, experts, and the local community. When implemented holistically, Cai Rang Floating Market can evolve from a heritage site

under threat into a new model of sustainable floating market, one that preserves its cultural essence while flexibly adapting to the intertwined challenges of urbanization, tourism, and climate change in the era of globalization.

In the broader context of global attention to intangible heritage, research on the spatial composition and sociocultural mechanisms of floating markets, particularly Cai Rang, remains essential. Examining the interrelations between riverine architecture, infrastructure, livelihoods, and community culture not only expands the scope of heritage preservation but also establishes a solid foundation for the sustainable development of water-based urban environments in the Mekong Delta.

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