International Journal of Architecture and Urbanism Vol. 09, No. 02 (2025) 358 – 367

International Journal of Architecture and Urbanism

Journal homepage: https://talenta.usu.ac.id/ijau

Analysis transformational strategy of urban vegetable market in the post-epidemic: A case study in China

Jie Deng*[1,2], Jirawat Vongphantuset[1], Veerawat Serevesmas[1], Yingjie Yu[2], Yingju Cheng[2], Qianshu Li[2]

[1]*Faculty of Decorative Arts, Silpakorn University, Bangkok, 10200, Thailand*
[2]*Hua LI college, Guangdong University of Technology, Guangzhou, 511325, China*

*Corresponding Author: deng.jie.2009@163.com

ARTICLE INFO

Article history:
Received 14-01-2025
Revised 18-06-2025
Accepted 25-07-2025
Available online 08-08-2025

E-ISSN: 2622-1640
P-ISSN: 2622-0008

How to cite:
Deng J, et.al. Analysis transformational strategy of urban vegetable market in the post-epidemic: A case study in China. International Journal of Architecture and Urbanism. 2025. 9(2):358-367.

http://doi.org/10.32734/ijau.v9i2.22364

ABSTRACT

The global outbreak of COVID-19 since 2019 has caused significant losses, profoundly affecting socio-economic development and altering human lifestyles. This paper examines the challenges faced by Tanzhou Vegetable Market in Zhongshan City, China, during the pandemic and proposes a transformation design for the market. The study utilizes a combination of literature review and field research methods to identify issues and develop solutions. The primary focus includes analyzing the existing problems at Tanzhou Vegetable Market, presenting the necessary transformation strategies for epidemic prevention, and detailing the design changes required. The renovation involves improving the market's external environment with modifications to the entrances, traffic flow, and the addition of green spaces. Internally, the design reorganization addresses functional layout, internal traffic flow, and the arrangement of stalls. The transformed market successfully integrates modern aesthetics and epidemic control measures while maintaining its core function as a space for vegetable transactions. The result is a more user-friendly, secure, and pleasant environment for the public. This study provides a practical framework for transforming other urban vegetable markets in the post-epidemic era.

Keywords: post-epidemic era, vegetable market

1. Introduction

COVID-19 pandemic is a serious public health event, of which the origin is still a mystery in the world. In China, the COVID-19 pandemic firstly emerged in Wuhan city, Hubei province, in early December, 2019[1]. Soon after that, the government of China has put forward a series of epidemic prevention and control policies. Responding to the COVID-19 epidemic, whole country has engaged in a number of measures covering epidemic treatment, prevention and control, including the city lockdown strategy [2]. City lockdown strategy has played an important role in curbing the diffusion of the epidemic and the epidemic situation in China was in control several months later. China has entered into the post-epidemic period since then. However, the real economy has been greatly influenced by the pandemic. Most merchants have suspended their business for several months, affecting the daily life of urban residents greatly. Among the affected business, vegetable market is one of the aspects facing huge operating pressure [2]. In order to deal with the economic problems, the state has introduced a series of policies. For example, the government of China has clearly proposed the policy of developing the small market-oriented economy during "Two Sessions" period in 2020 [3]. The

purpose of this policy was to promote employment and recover the city's prosperity. Under the guidance of the policy, we have studied vegetable market economy and found that the traditional vegetable market had many problems during development, especially during post-epidemic period.

Under the influence of the epidemic, the existing problems related to the public health crisis in the traditional vegetable market are as follow. First of all, the distribution of infrastructures was chaotic. Different types of goods were mixed and the related shops affected each other. Secondly, traffic flow lines are messy. Most of the vegetable markets didn't have distributary road for people and vehicles and there were with no fire standard channels. Thirdly, poor ventilation, drainage and garbage treatment in vegetable market has resulted in the phenomenon of dirty sanitation and odor in the cities. Fourthly, the traditional sales model became difficult during epidemic. It was difficult to supervise and manage food safety as well as selling, because most vendors were self-employed and of high mobility. Lastly, it is easier to develop infectious diseases. People contacted with each other more frequent in bad ventilation environment as space of market was closed. In order to prevent cross infection of the epidemic, the reconstruction of vegetable market becomes an important target of this study.

The reconstruction and development of the traditional vegetable market related to the quality of public space in the city is an indispensable part of the happiness of residents' life. According to the experience of epidemic prevention, personnel intensive density and long-time staying with the crowd in the market are dangerous. The safe physical examinations conducted before entering the space of the vegetable market can enhance the immunity of the vegetable market space system and promote the healthy and sustainable development of the entire vegetable market space. All measurements dealing with the sudden risky incident has helped to develop the spatial transformation and upgrade the vegetable market.

This paper has studied the problems of Tanzhou Vegetable Market in Zhongshan City of China and attempted to perform transformation design of this vegetable market which can be a reference for the upgrading of other urban vegetable markets during the post-epidemic period.

2. Method

This research predominantly employs a combination of literature review and field research methods. Through the literature review, several key strategies and concepts for the transformation of the vegetable market have been identified. Firstly, the epidemic prevention strategy, as proposed by Ahmed, forms the foundation for the design, addressing the transformation needs of Tanzhou Vegetable Market. Secondly, the concept of semi-open spaces, as suggested by Malaktou, was chosen for the market's transformation, considering the market's unique characteristics. Thirdly, Li's "market+park" theory was adopted as the overarching design concept for the transformation. Finally, the market space and layout design were guided by the "Upgrade Construction and Management Specification for Farmers Market," which informed both the internal and external space designs. Equally important is the use of field research, which involved gathering data through direct observation and photographs. These images revealed several ongoing issues within the vegetable market. The main issues were categorized into three primary concerns: inadequate infrastructure, disorganized spatial layout, and outdated operational models. Additionally, a set of spatial data was gathered via a network map, which measured the distance between the market and surrounding neighborhoods. These measurements informed both the external market environment and internal functional layout design. Ultimately, the transformation of Tanzhou Vegetable Market was based on these data points, which formed the foundation for the design.

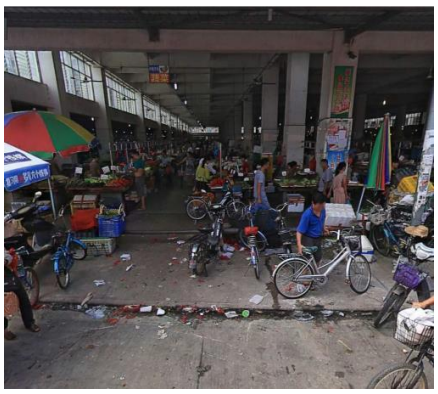
3. Results and Discussion

Problems in Tanzhou Vegetable Market

The key issues identified within Tanzhou Vegetable Market can be categorized into three main areas (Figure 1). First, the market suffers from inadequate infrastructure, with various products like vegetables, fruits, meats, and aquatic items creating a disorganized and unsanitary environment [4]. Perishable items like vegetables and fruits, along with frozen aquatic goods, cause the floor to become wet, while strong odors from seafood and meat linger. The infrastructure is outdated, with aging drainage systems and poor lighting, some of which were

installed over two to three decades ago. This, coupled with insufficient construction standards and poor ventilation, creates fire hazards and delays in sanitation and disinfection, failing to meet epidemic prevention standards. In such an environment, an epidemic could spread rapidly, posing serious risks to public health [5]. Second, the spatial layout of the market is inefficient, with poor land utilization and a poorly defined business zone. The original market design did not account for future growth, leading to disordered internal streamlines where freight and shoppers' paths overlap, which can lead to confusion and increase transmission risks during peak hours when the market is crowded. Narrow public spaces and limited functional areas further exacerbate traffic congestion, particularly for peripheral vehicles. Although temporary measures, such as closing entrances and exits, have been implemented to maintain order during the pandemic, these measures have disrupted the market's normal flow, impairing its operational efficiency [4]. Lastly, the outdated operational model of the vegetable market is increasingly vulnerable to disruption from online commerce and e-commerce platforms. The lack of unified management, standardized systems, and a solid public health plan weakens the market's ability to adapt, making it more susceptible to pressures from the growing e-commerce industry [6]. The aging infrastructure and inefficient commodity circulation systems further limit the market's potential for growth and innovation. Given these challenges, a comprehensive reevaluation of the market's operational model is necessary to develop new strategies for innovation and modernization, especially in the post-pandemic era [7].

(a) Public access between market blocks



(b) Internal space between stands

Figure 1 Photos of Tanzhou Market

Transformation Demand during The Post-Epidemic Period

The vegetable market faced significant challenges during the COVID-19 pandemic, particularly in terms of business modernization, functional expansion, and management optimization. To address these challenges, the transformation design of the market implemented a semi-closed management approach during the epidemic. Access to the market was controlled by strategically positioning the main entrance near a one-way street, with select entrances designated to open or close based on specific needs. This helped manage the flow of goods more effectively. Additionally, stringent procedures were established for controlling personnel access, including body temperature checks, verification of travel records, and mandatory registration for market visits. These steps were essential in controlling the movement of people and goods in line with epidemic prevention protocols. The transformation also categorized epidemic prevention needs into two primary zones within the market (Figure 2).

The first zone focuses on the entry and exit processes. Upon entering, individuals must undergo a temperature check. For goods entering the market, the relevant personnel, vehicles, and items are quarantined, with particular attention paid to cold-chain products [8]. For instance, seafood products undergo rigorous quarantine processes, including sample storage, segregation into classified partitions, and the establishment of dedicated operational spaces for handling these items [9].

The second zone pertains to the sales section, where maintaining safe distances between booths and stands is critical. This ensures the crowd's social distancing, helping to reduce the risk of cross-transmission [10]. According to research, consumers feel secure when the available space per person is at least 4 square meters, while the environment feels crowded if the space drops to 1.5 square meters per person [10]. This subjective sense of space is an essential factor in the market's design, as it directly impacts the comfort and safety of the visitors. Consequently, the infrastructure within the market needs to be upgraded to align with the demands of the post-pandemic era, ensuring sufficient space and enhanced safety measures for both consumers and vendors.

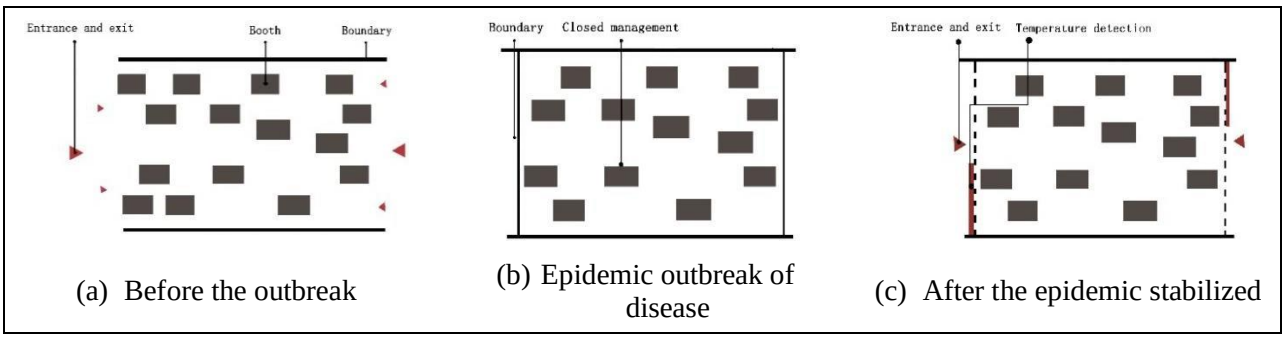


Figure 2 Different period of market before and after the epidemic

Design of Construction Space of The Vegetable Market

The Position of Vegetable Market Space Design

In the context of the post-epidemic era, there is an increasing demand for human-centered space design in the transformation of vegetable markets. Traditionally, the vegetable market served solely as a place for sales; however, its role has expanded to become a vital social hub. Typically located at road intersections, traditional vegetable markets often feature large, closed buildings that can create a feeling of confinement, which in turn exacerbates traffic congestion and impedes the flow of both goods and people.

Reflecting on the evolution of vegetable market designs and examining various global case studies, it is clear that a "semi-open" space configuration is an effective approach for the interior layout of the market [11]. Therefore, the design for the transformed market incorporates a semi-open structure for the inner spaces, promoting better ventilation and easier traffic movement. In contrast, the outer space is designed to be fully open, enhancing air circulation and allowing for seamless interaction with adjacent commercial areas. This open design enables the vegetable market to integrate more naturally into the surrounding urban environment, fostering connectivity through continuous streets that link the market to nearby commercial spaces.

Following the ideas proposed by Japanese architect Ruhara Yoshiyoshi, the market design expands its spatial coverage from the initially enclosed internal area to the surrounding external environment [12]. The "market+park" concept [4] was adopted to create a unified space that blends the market with public park elements, thereby promoting the flow of people and goods in a vibrant, urban context. Unlike traditional vegetable markets, the "park+" model encourages social interaction by incorporating green spaces, thereby creating a pleasant and inviting environment. The design also envisions a network of interconnected streets and lanes that ties the market to other parts of the city, establishing an organized and harmonious urban space that supports a modern, efficient commercial system.

Circumstances of Tanzhou Market

The customers who visit Tanzhou Market primarily fall into two categories: local residents and immigrants, most of whom are distributed across three nearby communities. The main reasons for their preference to shop at this market are the freshness of the products and its close proximity. A majority of the residents live on the outskirts of the market. The nearest neighborhood is only about 50 meters away from the market, while another community is situated roughly 200 meters from the market. The furthest neighborhood is located

approximately 400 meters from the market (Figure 3). The market itself is surrounded by a major arterial highway, several secondary roads, and various smaller streets that provide access from different directions.

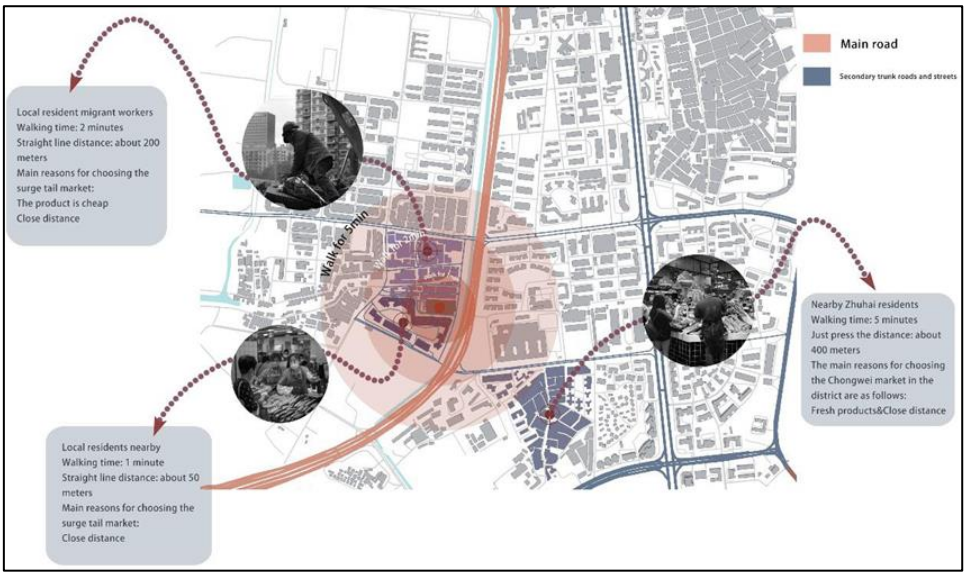


Figure 3 Analysis of Tanzhou Market

Design of external market environment

Renovation Design of Entrance and Exit

Tanzhou Vegetable Market is an open-air market with numerous internal roads. Based on the aerial view of the market, it is evident that the layout of the roads is disorganized, with multiple entrances that make it difficult to identify a primary access point. This lack of clarity, combined with high traffic flow from both pedestrians and vehicles, creates a potential security risk, particularly since it is the only vegetable market in the area.

To address these issues, a renovation design was developed for the market's entrances and exits. The design includes three designated entrances, all of which can also serve as exits. One of these is designated as the main entrance, while the other two are secondary entrances. The main entrance is wider, allowing for a higher volume of both people and larger vehicles to pass through. The secondary entrances, while narrower, improve the overall circulation within the market, offering additional access points, particularly convenient for people coming from the north. In the post-pandemic context, having fewer, but more controlled entrances is advantageous for epidemic prevention. It allows for easier monitoring of individuals, goods, and vehicles entering the market, ensuring better compliance with safety protocols. The redesigned entrance and exit system not only facilitates better market flow but also plays a critical role in enhancing epidemic control efforts (Figure 4).

Adjustment and Reconstruction Design in Venue Streamline

The internal circulation of Tanzhou Vegetable Market consists of both traffic flow lines and pedestrian movement pathways [13]. To alleviate congestion and enhance operational efficiency, it is essential to separate vehicle flow from pedestrian movement. The market design incorporates two primary traffic routes that broadly surround the market area, with one route featuring branches to accommodate additional access points. Pedestrian pathways are abundant and strategically distributed throughout the market to ensure smooth movement, allowing for uninterrupted transactions at each stand. An important aspect of the design is the access for freight traffic: the main entrance for freight is positioned away from the market to prevent congestion during peak hours, thus facilitating controlled parking and unloading. This arrangement also connects the weighing area with the quarantine space, which is particularly crucial for handling cold-chain goods, such as seafood, in the post-epidemic period [8].

Figure 4 visually illustrates the redesigned internal circulation system, clearly distinguishing the flow of vehicles and pedestrians. The layout of the two main traffic streamlines—one branching and the other more direct—improves overall efficiency by preventing congestion in critical areas. The strategic placement of the freight entrance, positioned away from the market's core, ensures that loading and unloading activities do not disrupt pedestrian flow. The inclusion of quarantine spaces for cold-chain products, such as seafood, is vital for maintaining health and safety standards. The figure effectively demonstrates how the redesigned circulation contributes to both operational efficiency and enhanced epidemic control measures, ensuring a smooth and secure market environment.

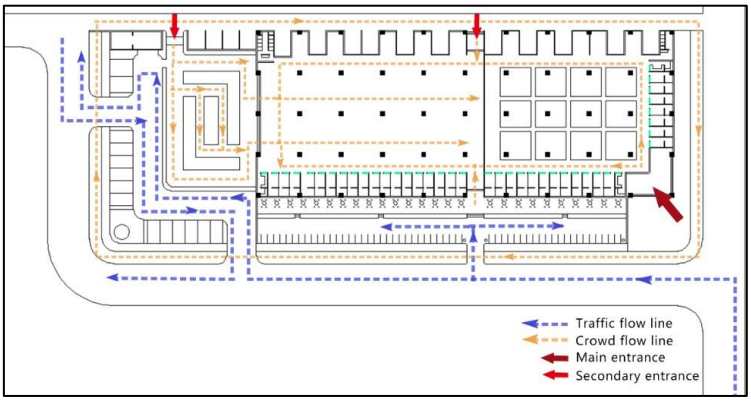
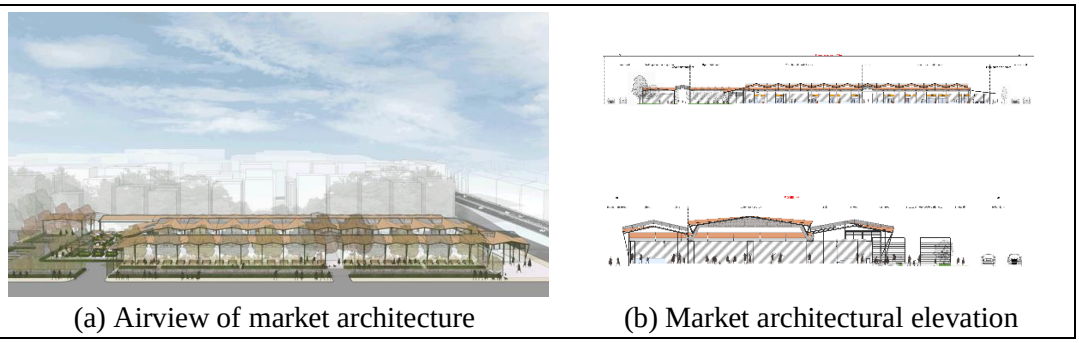


Figure 4 Floor plan of the vegetable market

Greening design of market transformation

Tanzhou Vegetable Market has been limited in terms of greening, especially with the surrounding residential areas, which makes it challenging to implement effective greening strategies. Integrating green spaces is essential for improving air quality, which is especially crucial during the pandemic, given the large number of people present in the market at any given time [8]. As a result, it is imperative to incorporate a thoughtful greening design. The renovation efforts for landscape greening have been implemented through multiple stages. First, the square within the market has been designed with a green belt that divides the space into the entrance area and a green landscape area. The greening design of the square includes a hard surface with three pools, pathways, rest areas, and other landscape elements such as park spaces. These green spaces not only enhance the aesthetic quality but also serve practical business purposes, creating flexible areas for rest and leisure, which can attract more visitors. The green landscape is enriched with a variety of trees that provide shaded areas, contributing to a more comfortable environment for both shoppers and vendors. Moreover, the greening elements of the market help form a natural isolation zone, enhancing the market's security and creating a space that promotes health and well-being. In the post-pandemic era, this green area will not only help improve air quality but also act as a natural buffer, ensuring better health protection for individuals within the market. The integration of green spaces aligns with the "market + park" concept, creating a harmonious blend between commercial and recreational spaces. Additionally, the optimization of the market's layout ensures that it is well-connected with surrounding city streets and public squares, making it more integrated into the urban environment (Figure 5).



(a) Airview of market architecture (b) Market architectural elevation

Figure 5 Building drawing of vegetable market

Internal space designs of the vegetable market

Internal Function Layout Renovation

The internal layout of the vegetable market is organized into distinct functional zones, with each unit serving a specific purpose. The spatial arrangement is designed to ensure coordination between these units, facilitating smooth operation and enhancing efficiency. The core spaces within the market include the trading center, offices, dining and leisure areas, parking facilities, and more [14] [15]. However, the existing design faces several issues, such as disorganized traffic flow and overcrowded conditions. To address these challenges, the market's internal layout requires a thorough functional reorganization. This includes the optimization of transport pathways, creation of a more comfortable environment, and ensuring public health safety.

The functional reorganization of the market will involve designating specific areas for different types of stalls, such as fruit and vegetable stands, cooked food vendors, fresh seafood, frozen foods, and meat stalls [13]. The restructured market will also prioritize convenient transportation by incorporating well-planned access points for vehicles, as well as designated parking and unloading areas. To improve the overall user experience, the market will include essential amenities such as clean restrooms, storage areas, and waste treatment facilities. Moreover, public health security will be addressed through the integration of inspection and quarantine spaces, ensuring that products meet safety standards and that health protocols are maintained (Figure 6).

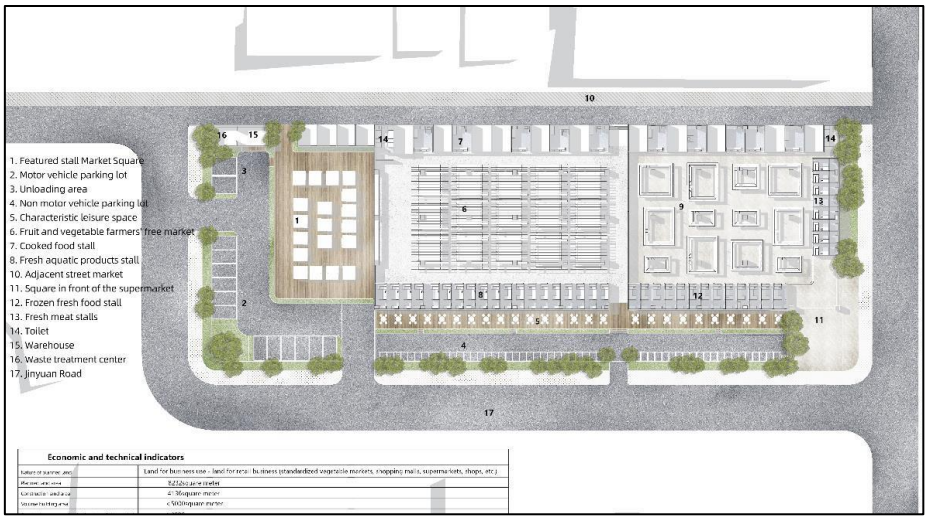


Figure 6 Floor plan of the vegetable market

Internal Streamline Transformation

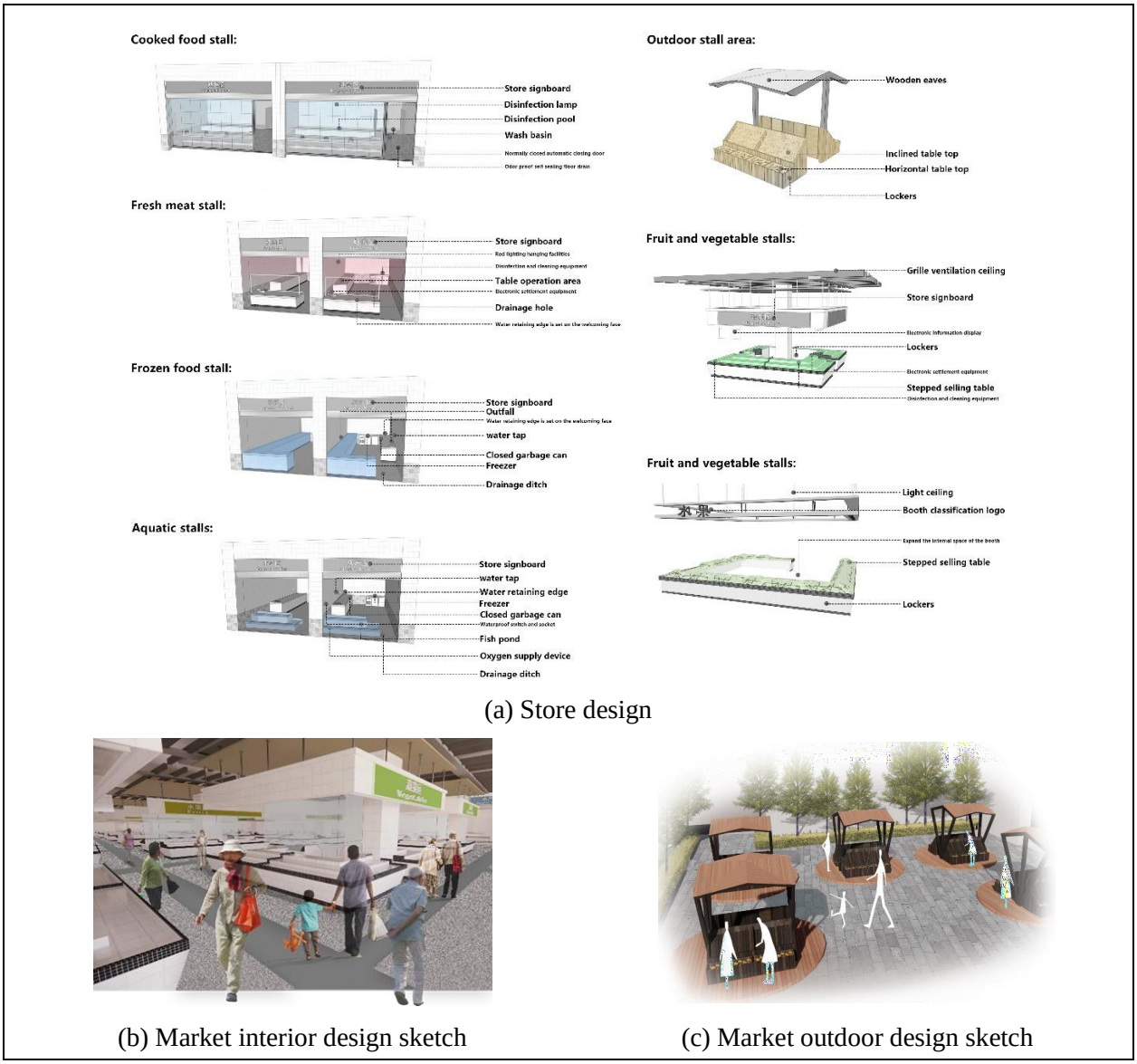
The horizontal traffic lines within the building are typically crowded with various individuals such as consumers, delivery staff, and management. These different groups engage in a wide range of activities. Therefore, it is crucial that the design of both primary and secondary pathways effectively accommodates these different groups. Special attention was given to designing these pathways with considerations for emergencies, ensuring that people can be rapidly and safely evacuated in case of a crisis. To prevent congestion, the market's layout follows a circulation loop system, enabling customers to move without needing to retrace their steps.

Stall and Store Renovation Design

The allocated space for each stall and store, which represents the smallest unit in the market, plays a critical role in facilitating the sale of vegetables and other goods. When the current stalls no longer meet vendor requirements, it often leads to unauthorized modifications, resulting in disorder and inefficiency. To overcome this issue, a standardized design should be implemented. Prefabricated construction methods will allow for custom-tailored configurations to meet users' needs. Key stalls in the market include those for cooked food, fresh meat, frozen foods, and aquatic products. These stalls are equipped with essential facilities such as

cleaning stations, storage, and operational tools. The design of these stalls varies: for instance, fruit and vegetable stalls need ample space for display, while meat stalls require hanging facilities with specific lighting. Similarly, frozen food stalls must have access to water, tanks, and functional countertops.

Given the ongoing threat of pandemics, each stall's entrance is strategically placed to avoid direct connections between the inner and outer spaces. The market's layout utilizes a modular column span system, where smaller stalls occupy one-third of the column span, and larger ones use half or the full span. This approach allows for flexibility, enabling independent commercial units to be rented or sold based on these standardized configurations, thus offering adaptability as market needs evolve (Figure 7).



(a) Store design

(b) Market interior design sketch

(c) Market outdoor design sketch

Figure 7 Stall and store renovation design

4. Conclusion

Traditional vegetable markets often suffer from various issues, such as poorly organized infrastructure, disordered traffic flow, inadequate sanitation, and unpleasant odors. These problems are exacerbated during epidemic periods, as such markets are more susceptible to the spread of infectious diseases and face challenges in maintaining smooth transactional activities. By examining the issues faced by the Tanzhou Vegetable Market in Zhongshan City, China, during the epidemic, and applying a transformation design approach through a combination of literature review and field research, this study proposes a comprehensive renovation plan for both the market's external environment and internal layout. The transformation successfully addresses the

shortcomings of traditional markets, combining modern design aesthetics with enhanced epidemic prevention measures while preserving the core function of vegetable transactions. As a result, the transformed vegetable market offers a more humanized and comfortable environment for its users, fostering a better quality of life. The positive outcomes of this design transformation are supported by a thorough analysis of literature and field observations. However, it is important to note that the practical implementation of these proposed changes in the traditional market is yet to be carried out, which remains a challenge and an area requiring further attention.

5. Acknowledgments

This paper represents a partial outcome of the first author's research project. The first author is currently pursuing a Doctoral Program in Design Arts (International Program) at the Faculty of Decorative Arts, Silpakorn University, Thailand. The authors wish to express their sincere gratitude to the faculty members at Silpakorn University for their guidance and support. Additionally, we would like to acknowledge the valuable contributions of several undergraduate students from Guangzhou Hua Li University, whose assistance in the field research was instrumental in the completion of this study.

6. Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper. No financial or personal relationships have influenced or could be perceived to influence the work presented in this study. All research and design processes were conducted impartially, based solely on the objectives of the study and its academic merit.

References

[1] Guan, W. J., Ni, Z. Y., Hu, Y., Liang, W. H., Ou, C. Q., He, J. X., ... & Zhong, N. S. (2020). Clinical characteristics of coronavirus disease 2019 in China. New England journal of medicine, 382(18), 1708-1720. DOI: 10.1056/NEJMoa2002032

[2] Sun, Y. (2024). Examine the Impacts of the Coronavirus Crisis on Vegetable Pricing. In Proceedings of the 1st International Conference on Engineering Management, Information Technology and Intelligence - EMITI; ISBN 978-989-758-713-9, SciTePress, pages 747-753. DOI: 10.5220/0012972200004508

[3] Makszim Györgyné Nagy, T., & Soós, A. (2025). Land sharing and land sparing in agriculture – Can we change our attitudes? EuroChoices, 16, 1-9. https://doi.org/10.1088/1748-9326/ac2b5f

[4] Wang, X., Zhang, Y.-Q., & Cai, L. (2021). Spatiotemporal characteristics of the COVID-19 resurgence in the metropolitan wholesale market of Beijing, China. Journal of Travel Medicine. https://doi.org/10.1093/jtm/taab008

[5] Hall, C., & Paddison, R. (2024). Regenerative tourism development as a response to crisis: harnessing practice-led approaches. Tourism Geographies. https://doi.org/10.1080/14616688.2024.2381071

[6] Ruan, Y., & Zhang, Y. (2022). Preference characteristics on consumers' online consumption of fresh agricultural products under the outbreak of COVID-19. Procedia Computer Science, 207, 4486-4495. https://doi.org/10.1016/j.procs.2022.09.512

[7] Wang, W., & Wei, X. (2021). Layout analysis and planning strategy of market in the central area of big cities from the perspective of "Urban People"—Take Wuhan as an example. Journal of Humanities, Arts and Social Science. https://doi.org/10.26855/jhass.2021.07.011

[8] Sun, Y. (2024). Analysis of the impact of the COVID-19 on agricultural product futures and prospect. Finance & Economics. https://doi.org/10.61173/q0dbv929

[9] Kong, J., Li, W., Hu, J., Zhao, S., Yue, T., Li, Z., & Xia, Y. (2022). The safety of cold-chain food in post-COVID-19 pandemic: Precaution and quarantine. Foods, 11(11), 1540. https://doi.org/10.3390/foods11111540

[10] Ahmed, I., Ahmad, M., & Jeon, G. (2021). Social distance monitoring framework using deep learning architecture to control infection transmission of COVID-19 pandemic. Sustainable Cities and Society, 69, 102777. https://doi.org/10.1016/j.scs.2021.102777

[11] Philokyprou, M., Michael, A., & Malaktou, E. (2021). A typological, environmental and socio-cultural study of semi-open spaces in the Eastern Mediterranean vernacular architecture: The case of Cyprus. Frontiers of Architectural Research, 10(2), 1-15. https://doi.org/10.1016/J.FOAR.2021.03.001

[12] Burris, M. (2012). Astroimpolitic: Organizing outer space by the sword. Strategic Studies Quarterly. https://doi.org/10.2139/SSRN.2414521

[13] Ledesma, E., He, A., Warsaw, P., Suerth, L., Morales, A., Rosenblum, L., & Wiedenfeld, B. (2021). Citizen scientist: Farm 2 facts supporting farmers markets. Sustainability, 13(11), 6162. https://doi.org/10.3390/SU13116162

[14] Gunupudi, L., & De', R. (2013). Market separations perspective of agricultural markets and successful AMIS: Beyond technical rationality. In Agricultural Market Information Systems (AMIS) and Information Systems for Global Food Security (pp. 105-120). https://doi.org/10.1007/978-3-642-38862-0_7

[15] Jan, M. (2021). Agricultural markets. Handbook of Critical Agrarian Studies. https://doi.org/10.4337/9781788972468.00028.