

Participatory and Human-Centered Data Analysis for Public Space Improvement at Klong Suan Floating Market in Thailand

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ABSTRACT

Khlong Suan Market is a historic floating market located across Samut Prakan Province and Chachoengsao Province, Thailand. The majority of inhabitants and visitors are elderly, and preliminary observations found that existing public spaces do not adequately support elderly users, leading to difficulty in mobility and potential safety risks. The study divided public spaces into six functional areas for analysis: (1) main parking area, (2) indoor parking area, (3) public toilets, (4) side walkway entrance, (5) entrance/exit across the mosque, and (6) riverside walkway. A survey method was used together with a Participatory Action Research (PAR) approach. Data were collected from 400 samples, including residents and travelers, and were analyzed to determine appropriate space improvement guidelines. Findings indicate key needs: redesigning parking areas for cars, motorcycles, and disabled users; improving walkway surfaces with anti-slip materials; providing dual-level handrails; using low-heat materials; renovating toilets with disabled access; adding public seating; and improving landscape shading. These results highlight the importance of human-centered design to enhance public safety and comfort for elderly users.

.Keywords: Participatory, Human-Centered, Public Space

Introduction

“Khlong Suan” is a historic community founded during the reign of King Chulalongkorn (Rama V). The area served as a water transportation route linking Pratunam Thaw Pier in Chachoengsao Province to Pratunam (Sraphum Palace) in Bangkok. Khlong Suan evolved into a culturally diverse community comprising Thai–Chinese, Thai–Buddhist, and Thai–Muslim groups. This diversity is evident through the coexistence of various religious structures such as temples and a mosque and the presence of vegetarian dining establishments nearby. (Wikipedia,2024) Khlong Suan Floating Market is often referred to as the “Two Provinces Market” due to its unique location—spanning Ban Pho District in Chachoengsao Province and Bang Bo District in Samut Prakan Province. The preservation of traditional wooden shophouses and architectural features earned the market an Architectural Design Award in 2004 (B.E. 2547) (Pimada KanyaBotan,2013). Although culturally valuable, elderly inhabitants and elderly travelers encounter several problems within public spaces, such as unsafe walkways and disorganized parking. These issues may result in inconvenience or accidents. Therefore, public space improvement must be conducted using a participatory process to ensure that solutions reflect real user needs. A Human-Centered and Participatory Action Research (PAR) approach aligns with the concept of community-based development (Polpanadham, 2011; Phukamchanoat, 2022) and supports the improvement of elderly quality of life at Khlong Suan Market.

Research objectives

1. To study and analyze the physical environment and spatial context surrounding Klong Suan Floating Market.

2. To analyze and determine improvement areas based on data collected from residents and tourists through a participatory process.

Research methodology

When conducting the study at Klong Suan Floating Market, the research area was divided into two main zones: **Zone A**, located in Samut Prakan Province, and **Zone B**, located in Chachoengsao Province. Each zone was further categorized into eight public sub-spaces according to their functional characteristics:

- 1) Main Parking Area,
- 2) Indoor Parking Area,
- 3) Public Toilet Area,
- 4) Side Walkway Entrance,
- 5) Entrance/Exit Across the Mosque, And
- 6) Riverside Walkway.

Each of the eight spaces was physically surveyed to understand existing problems and spatial limitations, particularly regarding accessibility, safety, and convenience for elderly users. The study found that Khlong Suan Market is privately owned, which creates limitations in terms of physical modification and major structural changes. Therefore, this research proposes fundamental improvement guidelines that can be implemented within these restrictions while respecting the original architectural character and cultural identity of the market.



Figure 1. Khlong Suan Market Map

1.The target population was divided into two main groups:

1.1 Residents living in the Khlong Suan Market area

This group consists of local inhabitants residing in Thep Rat Sub-district, Ban Pho District, Chachoengsao Province, and Khlong Suan Sub-district, Bang Bo District, Samut Prakan Province, along the

Khlong Prawet Buri Rom canal. According to community records, approximately 190 residents permanently live within the market’s surrounding area (National Statistical Office,2020). These residents represent daily users of public spaces; therefore, their opinions and experiences are crucial for understanding long-term spatial needs, safety concerns, and cultural identity.

1.2 Travelers and tourists

Since the exact number of travelers fluctuates throughout the year, it was necessary to determine a statistically appropriate sample size using a 95% confidence level (Suansri, 2016). Based on community tourism data, an average of 40 visitors per day results in approximately 14,459 travelers annually. This figure was referenced from the Pak Khlong Talat Committee and Miss Chantima Achapanit, President of the Community Committee (Suthitakon, 2012).

To ensure accurate representation of both residents and travelers, a total sample size of 400 respondents was calculated using Taro Yamane’s formula. These participants completed structured questionnaires evaluating accessibility issues, user satisfaction, spatial comfort, and safety concerns. Furthermore, qualitative interviews were conducted with six key stakeholders: two local residents, one local administrative officer, one tourist, and one architect involved in the planning and development of the market. The interview insights were synthesized with the questionnaire results and jointly analyzed to form human-centered public space improvement guidelines for future implementation.

Calculation of sample group by using Taro Yamane’s formula

$$n = \frac{N}{1+Ne^2} \tag{1}$$

$$n = \frac{560.16}{1+5728(0.05)^2} = 400$$

Providing questionnaire come from data analysis and issue involved with the design

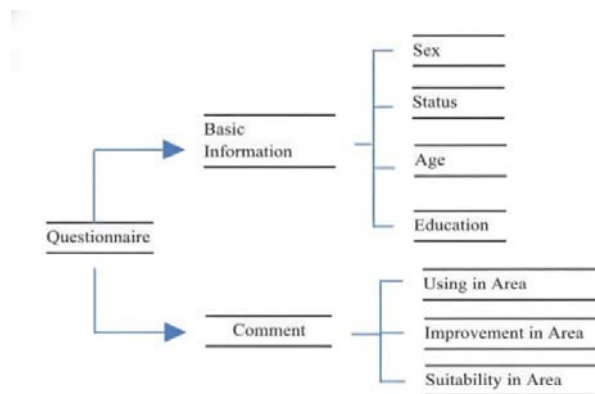


Figure 2. Diagrams of Users and Stakeholder

The sample size was determined using Taro Yamane’s formula with a 95% confidence level. Data obtained from the questionnaires were applied to develop public space modification guidelines. The responses were analyzed and summarized to identify user needs and propose improvement solutions for each area.

2.Survey Method

A physical site survey was conducted in all six spaces to examine existing spatial conditions, circulation patterns, accessibility, safety risks, and environmental comfort. Observation techniques were used to record walking behavior, crowd movement, vehicle access, and potential hazards such as slippery surfaces or obstructed pathways. Photographic documentation, field measurements, and mapping were applied to visualize spatial barriers and evaluate design constraints.

3. Tools and Data Collection Instruments

To collect user data, the research employed:

- 1) **Structured questionnaires** for residents and travelers
- 2) **Behavioral observation forms** for pedestrian and wheelchair movement
- 3) **Photographic records** for physical evidence
- 4) **Stakeholder interviews** with local vendors, tourists, elderly users, and community leaders

The questionnaire focused on user satisfaction, perceived safety, accessibility needs, and environmental comfort. Data from 399 respondents were analyzed statistically to identify priority areas for improvement.

4. Connection to Human-Centered Design

The study incorporated the principles of **Human-Centered Design (HCD)** by emphasizing the needs, behavior, and physical limitations of real users—especially elderly people. Feedback from users was not only collected but also used to guide decision-making. Instead of proposing universal physical upgrades, design recommendations were based on evidence of user experience, such as:

- 1) Elderly difficulty in walking on slippery surfaces
- 2) Lack of handrails for stability
- 3) Insufficient seating for rest
- 4) Lack of shaded areas increasing heat exposure
- 5) Poor toilet accessibility for disabled users
- 6) Unsafe transitions between indoor and outdoor spaces

These insights ensured that the improvement proposals were **human-responsive, functionally practical,** and aligned with real behavior patterns.

Findings

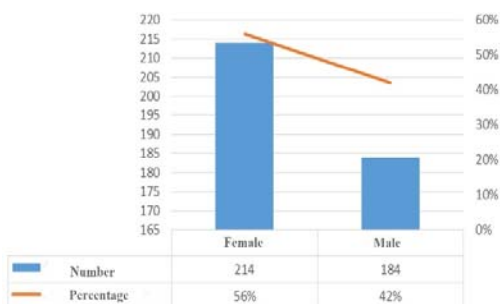


Figure 3. Sex

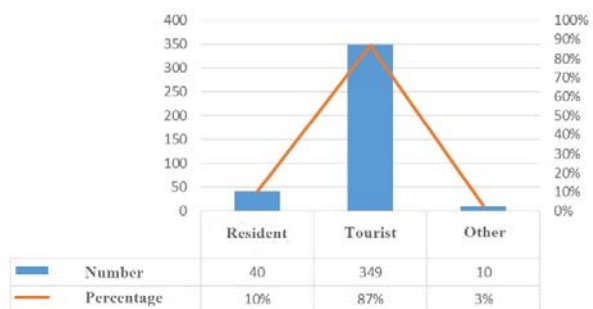


Figure 4. Status

According to Figure 3, the data indicate that female residents provided more responses than male residents, representing 56% and 42% respectively. This difference may be attributed to the fact that most female respondents are housewives who spend more time at home, whereas a large number of male residents work outside

the community, making them less available to participate in the survey. Figure 4 illustrates the proportion of original residents compared to tourists in the sample group. The findings indicate that 87% of respondents were tourists, whereas only 10% were original residents. Consequently, the analyzed results are largely influenced by the needs, preferences, and experiences of tourists who frequently visit and use the public spaces at Klong Suan Floating Market. This makes the data highly reliable for understanding service demands from the visitor perspective.

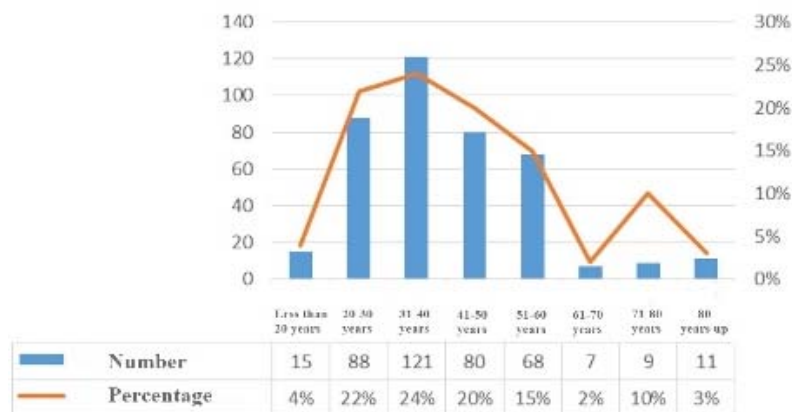


Figure 5. Age

The surveyed sample revealed that the majority of respondents were between 20 and 50 years old. The highest proportion was found in the 20–30 age group (22%), while only 15% of the sample were elderly aged 60 and above (Figure.5). This suggests that most visitors are within an age range that allows physical mobility and comfort when navigating the long walkways of the market. Due to the extended walking distance, elderly individuals may be less inclined to visit frequently, reflecting a potential accessibility challenge for older users.

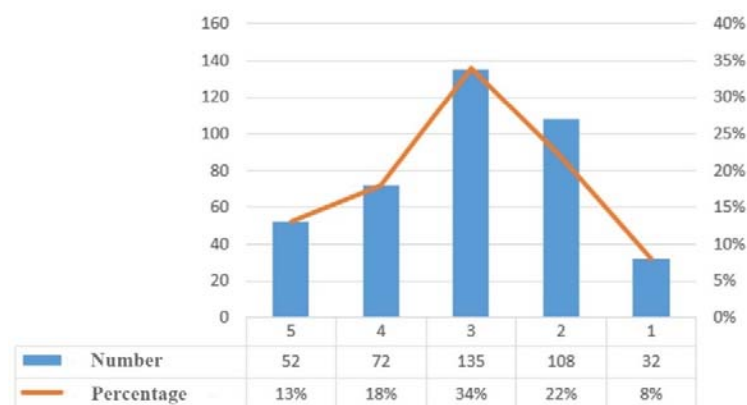


Figure 6. User Opinions on Parking Area Usage

In assessing public space usage within Klong Suan Floating Market, the first evaluation point was the parking area. Survey results show that 34% of tourists viewed the parking area as “fair,” while 22% rated it as “poor” (Figure.6). These negative perceptions may be attributed to the considerable walking distance from the parking area to the market, as well as insufficient supporting infrastructure, such as the lack of sunshade roofing and the absence of security or parking personnel. As a result, this area presents a critical issue and should be prioritized for future public space improvement efforts.

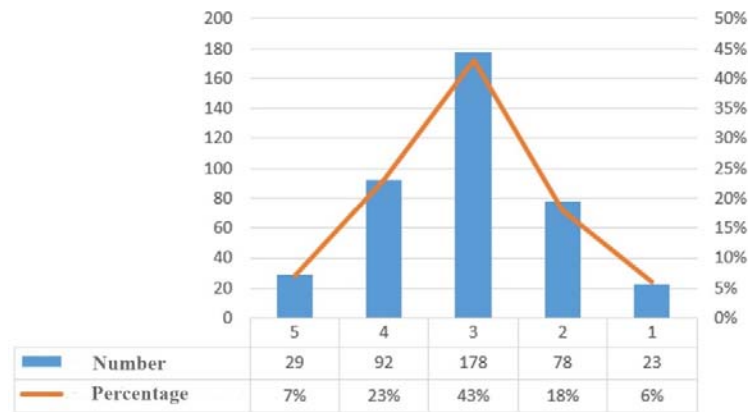


Figure 7. User Opinions on Toilet Usage

In Figure 7, user feedback regarding toilet facilities in Klong Suan Floating Market shows that the majority of respondents expressed moderate satisfaction, with 43% rating the facilities as “average.” This indicates that hygiene and sanitation services are generally acceptable. The market provides three to four toilet locations, each maintaining cleanliness, proper ventilation, sufficient lighting, and complete sanitary equipment. The primary concern raised was the lack of aesthetic design or visual appeal, rather than functionality or hygiene standards. Another key suggestion from respondents was the provision of disabled-access toilets within the market. This addition would significantly improve accessibility and convenience for individuals with disabilities, as well as elderly visitors who require greater support when using public facilities.

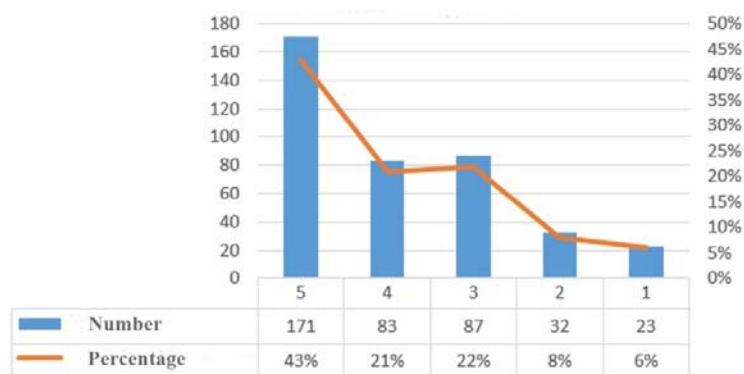


Figure 8. User Opinions on Walking Ramps, Anti-slip pathways and Handrails

According to Figure 8, 43% of respondents the largest percentage recommended the provision of ramps in areas where walkways have changes in level. In addition, respondents suggested using non-slip surface materials and installing handrails to improve safety. These features are essential for elderly individuals and wheelchair users who require accessible pathways to navigate different parts of the Klong Suan floating market safely and comfortably.

Conclusions and Discussion

The results from the physical site survey, questionnaire responses, and stakeholder interviews indicate that the collected data can be applied as guidelines for improving public spaces using human-centered and participatory principles. The aim is to enhance accessibility, safety, and comfort for general users, elderly individuals, and people with mobility difficulties who require wheelchairs or walking aids.

Recommended improvements include installing non-slip walkway surfaces, providing wheelchair-accessible ramps, adding dual-level handrails, creating shaded resting areas, constructing disabled-access toilets, and organizing safe and orderly parking areas.

Although several key public spaces within the floating market were analyzed, some areas—such as vendor zones and riverside commercial spaces—were not included in this study. These omissions present opportunities for future research. Further studies should also integrate local identity and cultural heritage to ensure sustainable development without altering the market's traditional character (Thongpanya, 2018; Gustia et al., 2024).

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