

Guidelines for Physical Environment and Facilities to Serve Elderly Tourists in Riverside Bungalows: A Case Study of Samut Songkhram Province

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Abstract

Samut Songkhram province has a policy to promote and upgrade conservation and tourism through a focus on cultural community, health, and elderly tourism. Therefore, it prioritizes enhancing the tourism infrastructure by renovating and upgrading existing accommodations to be suitable for elderly people, thereby improving and increasing the value of tourism. This research aims to study the readiness and preparation of tourism entrepreneurs in Samut Songkhram Province to meet the needs of elderly tourists and to propose design guidelines for managing the physical environment and amenities in the tourist accommodations. In addition, the study analyzes the costs of riverside bungalow renovation. This research collaborated with Samut Songkhram provincial government agencies and private entrepreneurs/ developers of riverside bungalows. The private sector stakeholders have the objective of upgrading their accommodations for senior tourists to support and promote this market segment in the provincial government tourism initiatives. The research method employs purposive sampling in field surveys and administration of questionnaires to obtain information about hotels and accommodations for ten riverside bungalow resorts. The evaluation is based on the legal requirements for provision of facilities that accommodate the disabled and elderly (Universal Design), as established in 2005 and 2021, under the Amazing Thailand Safety and Health Administration (SHA) standards set by the Ministry of Tourism and Sports and the Tourism Authority of Thailand (TAT), and disease prevention and control measures by the Ministry of Public Health for riverside hotels and accommodations. The findings reveal that most riverside bungalows participating in the study lack facilities for elderly tourists, such as emergency call signals in bedrooms and bathrooms, handrails at doors, and handrails in bathrooms for support. Therefore, the research proposes two categories for room improvement: rooms accessible by wheelchair and rooms not accessible by wheelchair, which are suitable only for elderly guests who use a cane or can walk independently. The study also includes an analysis of the cost estimations for improving elderly tourist rooms in riverside bungalows. The aim is to assist private entrepreneurs/developers and relevant agencies in applying these environmental management guidelines. This will raise awareness of the importance of Universal Design through a suitable and safe environment for older people, enhance standards, and increase tourism revenue in Samut Songkhram Province.

Keywords

Creating a physical environment; Elderly tourists; Riverside bungalow; Universal Design; Tourist accommodations

1. Introduction

Samut Songkhram Province serves as a prime destination for tourists of all ages and genders due to its proximity to Bangkok and its location on major transportation routes to other provinces. The province offers a diverse range of activities both on land and water, including conservation tourism and unique cultural experiences. Therefore, tourist attractions and accommodations in Samut Songkhram Province must be upgraded to support elderly tourists. Since 2005, Thailand has become an “aging society”; that is, at least 10% of the population is 60 or older. However, in 2023, Thailand reached another demographic milestone when the share of over-60s reached 20% of the population, or 13.2 million people, qualifying it as an “aged society” (Department of Older Persons [DOP], 2023). It therefore took less than 20 years for the share of older people in the population to double and for the country to go from an aging to an aged society, a rate that is faster than that recorded in many other countries, including Singapore and China (25 years), the United Kingdom (45 years), and the United States (69 years) (Chutijirawong & Sangmanacharoen, 2023). Moreover, in 2023, 13.6% of the Thai population was 65 or over and the United Nations (2022) expected this proportion to grow to more than 20% by 2029, which would then qualify Thailand as a super-aged society. This is one of the age groups of the UN’s demographic categories, and once Thailand reaches this stage, it will join countries such as Japan, Germany, Italy, and France. (Leenoi, 2024)

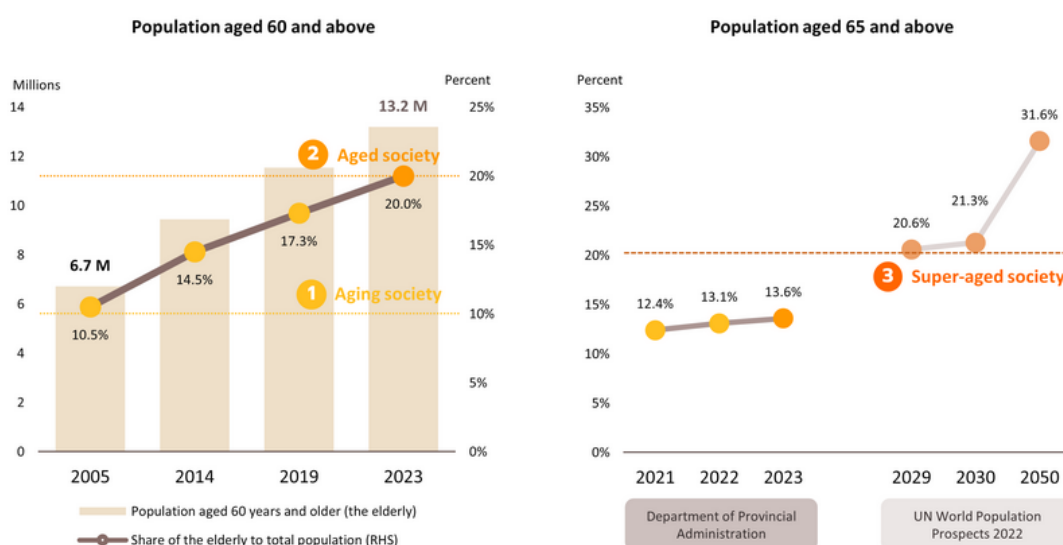


Figure 1. Thailand's aging demographics. Source: (Leenoi, 2024)

Figure 1 illustrates the shift in demographic structure towards an aging population, indicating that Thailand is moving towards an “Aged Society.” This transition necessitates adjustments to accommodate the growing number of elderly tourists. Changes must be made in public utilities, facilities, and tourism activities to ensure quality tourism that meets the needs of elderly tourists and provides universal access. The elderly tourism market increasingly is growing, as evidenced by the number of tourists visiting Samut Songkhram Province, which was 3,297,977 in 2023 and is projected to reach 3,410,953 in 2024 (Ministry of Tourism and Sports,

2024). In addition, the World Tourism Organization (UNWTO) estimates that by 2030, there will be 611 million elderly tourists globally, reflecting the growing trend of this market segment. According to the Department of Tourism, Ministry of Tourism and Sports, elderly tourists, both domestic and international, generated 195,891 million baht in revenue for Thailand in 2015, accounting for 8.66% of tourism revenue, with an annual growth rate of 17.21% (The Tourism Authority of Thailand [TAT], 2022). This increase in tourism revenue is attributed to the demographic shift towards an aging population and the growing popularity of “slow tourism,” which focuses on leisurely travel that does not adversely affect tourism resources.

The Samut Songkhram provincial government, in collaboration with the Center of Excellence in Elderly Care, has launched an initiative to prepare hotel entrepreneurs and tourist attractions for elderly travelers. This project aims to enhance hygiene and safety standards in existing riverside bungalows to promote senior tourism. A preliminary survey revealed that most riverside bungalows in Samut Songkhram Province do not have the necessary physical environment and facilities to accommodate elderly guests. Many of these accommodations were established by local residents who lack sufficient knowledge of Universal Design, safety, and health standards, making it challenging to renovate their bungalows for elderly tourists. Additionally, local entrepreneurs are concerned about the renovation costs.

Therefore, this research aims to assess the readiness of tourism entrepreneurs/developers in Samut Songkhram Province to cater to elderly tourists and propose guidelines for improving the physical environment and facilities of riverside bungalows. It also will analyze the estimated costs of upgrading these accommodations for senior travelers. The findings will provide hotel and accommodation operators and relevant agencies with strategies to enhance the environment and facilities to better serve elderly tourists. This includes consideration of new bungalow development and elevating existing riverside bungalow standards to meet hygiene and safety requirements critical to travelers. Ultimately, the goal is to improve service quality and increase tourism revenue in Samut Songkhram Province by better catering to the needs of elderly visitors.

2. Literature Review

2.1 Suitable Environments for the Elderly

As people age, physiological, biological, and mental changes can limit their ability to perform daily tasks and engage in social activities. Tasks such as climbing stairs, moving around the house, or using the bathroom become increasingly challenging. An environment designed to support these needs can improve the elderly's physical health, social participation, and overall quality of life. On the other hand, an unsuitable environment may lead to accidents, health complications, and even premature death. For instance, falls on stairs or slippery surfaces often result in fractures or injuries, leading to long-term dependency, fear of movement, and mental health issues like depression. These issues can escalate, causing infections or severe health deterioration, impacting both the individual and their caregivers (Ministry of Public Health, Department of Health, 2015).

Caring for the elderly imposes physical, emotional, and financial burdens on families and society, underlining the need for environments that accommodate their specific needs. Proactive planning is essential to create safe and accessible spaces before individuals reach old age. Universal Design principles, as stipulated in The Elderly Act B.E. 2546 (2003) advocate for environments that promote safety and convenience. This includes government and private-sector efforts to ensure public and private spaces such as buildings, transportation, and public services are accessible to all. Incentives like tax benefits, design consultations, and awards encourage private-sector participation, particularly in areas such as shopping malls, hospitals, and hotels.

2.2 The Needs of the Elderly

The needs of the elderly can be divided into three main categories (Nanthamongkolchai, 2021, as cited in Kin Rehabilitation & Homecar, 2024):

1. Physical Needs of the Elderly. These include the following:
 - 1.1) The need to maintain strong and healthy physical condition
 - 1.2) The need for close assistance and care
 - 1.3) The need for clean housing with good air quality and a healthy environment
 - 1.4) The need for age-appropriate and hygienic food
 - 1.5) The need for close nursing care during times of illness
 - 1.6) The need for timely and convenient health check-ups and medical treatments
 - 1.7) The desire to receive free medical services from the government
 - 1.8) The need for adequate rest and sufficient sleep
 - 1.9) The desire to maintain physical health and engage in regular exercise
 - 1.10) The need for facilities and tools that help prevent accidents
2. Psychological Needs of the Elderly

Physical and social changes affect the mental state of the elderly. They tend to adapt their minds and emotions according to bodily and environmental changes. Most elderly individuals strive to improve and develop their inner self in a positive direction, often demonstrating better emotional regulation than younger people. As they age, they generally become calmer and more composed. However, the way each elderly person expresses and experiences psychological needs varies depending on their personality, education, past experiences, and life environment.

3. Social and Economic Needs of the Elderly. These include the following:
 - 3.1) The need to receive attention and care from others
 - 3.2) The desire to be a part of the family, community, and social groups
 - 3.3) The wish to contribute to society and take on social roles that match their abilities
 - 3.4) The need for support or assistance from family and society in terms of living conditions, income, and government services
 - 3.5) The desire to live in a community and participate in various community and social activities
 - 3.6) The desire to reduce dependence on others
 - 3.7) The need for income security and elderly welfare benefits

2.3 The Concept of Universal Design

Designing spaces for the elderly aligns with the broader principles of Universal Design, ensuring accessibility and usability for everyone, regardless of age or physical ability. According to the Centre for Excellence in The Center for Universal Design (1997), the principles include:

1. Equitable Use: Accommodating all users equally, including those with disabilities, such as wheelchair users.
2. Flexibility in Use: Adapting to diverse needs, such as adjustable furniture or versatile facilities.
3. Simple and Intuitive Use: Features that are easy to understand, often utilizing symbols or straightforward interfaces.
4. Perceptible Information: Ensuring all essential information is communicated clearly through various formats, such as visual and auditory cues.

5. Tolerance for Error: Reducing risks through safe design and warning mechanisms.
6. Low Physical Effort: Creating environments that minimize exertion for users, making them accessible for people with limited physical abilities.
7. Size and Space for Approach: Designing spaces that accommodate a variety of users, including those with mobility aids.

These principles not only are beneficial for the elderly but also ensure inclusivity for children, pregnant women, and individuals with disabilities. By integrating Universal Design into public policies and private initiatives, communities can foster environments that support safety, accessibility, and dignity for all members of society.

3. Methodology

The methodology for this research combines both survey research and qualitative research approaches as summarized in Figure 2.

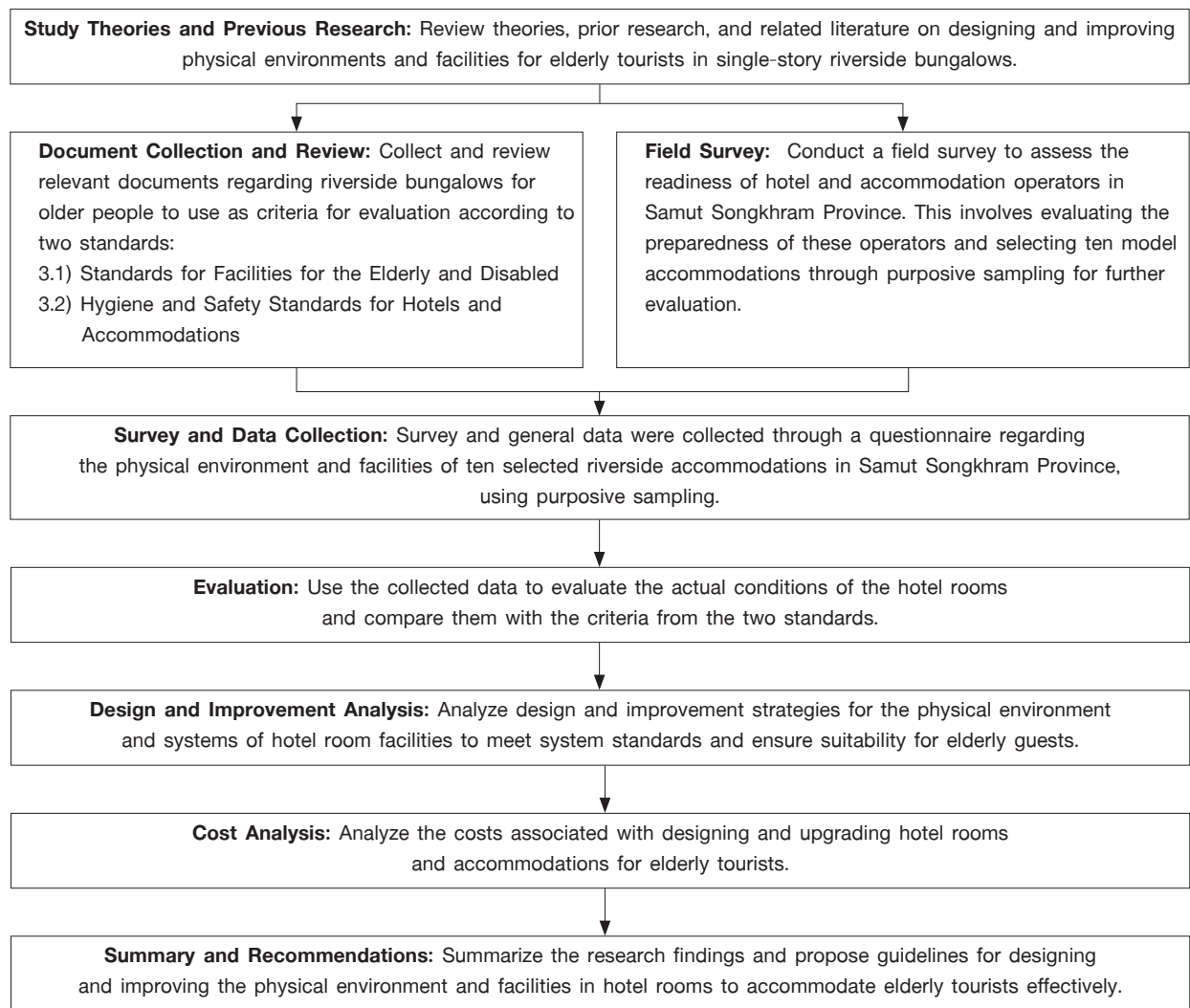


Figure 2. Summary of research methodology.

A fuller explanation of the research workflow as shown in Figure 2 is as follows:

1) Field Survey: A field survey was conducted to assess the readiness of hotel and accommodation operators in Samut Songkhram Province for elderly guests. This involved evaluating the preparedness of these operators and selecting ten model accommodations that were purposively sampled for further evaluation. The purposive sampling included entrepreneurs/private operators who volunteered for the project. The aim was to gather empirical data to develop accommodations suitable for older people and to elevate hygiene and safety standards. These include: Kanokrat Resort, Asita Eco Resort, The Grace Amphawa Hotel, and Ruean Namyen Resort, all located in Mueang Samut Songkhram District; Baan Mai Chai Khlong Resort, Baan Mai Hom Resort, and Bansuwan Homestay in Amphawa District; and Mee Phawa Resort, Nung Ni Bangkhonthei Resort, and Baan Nam Pen Resort in Bang Khonthei District.

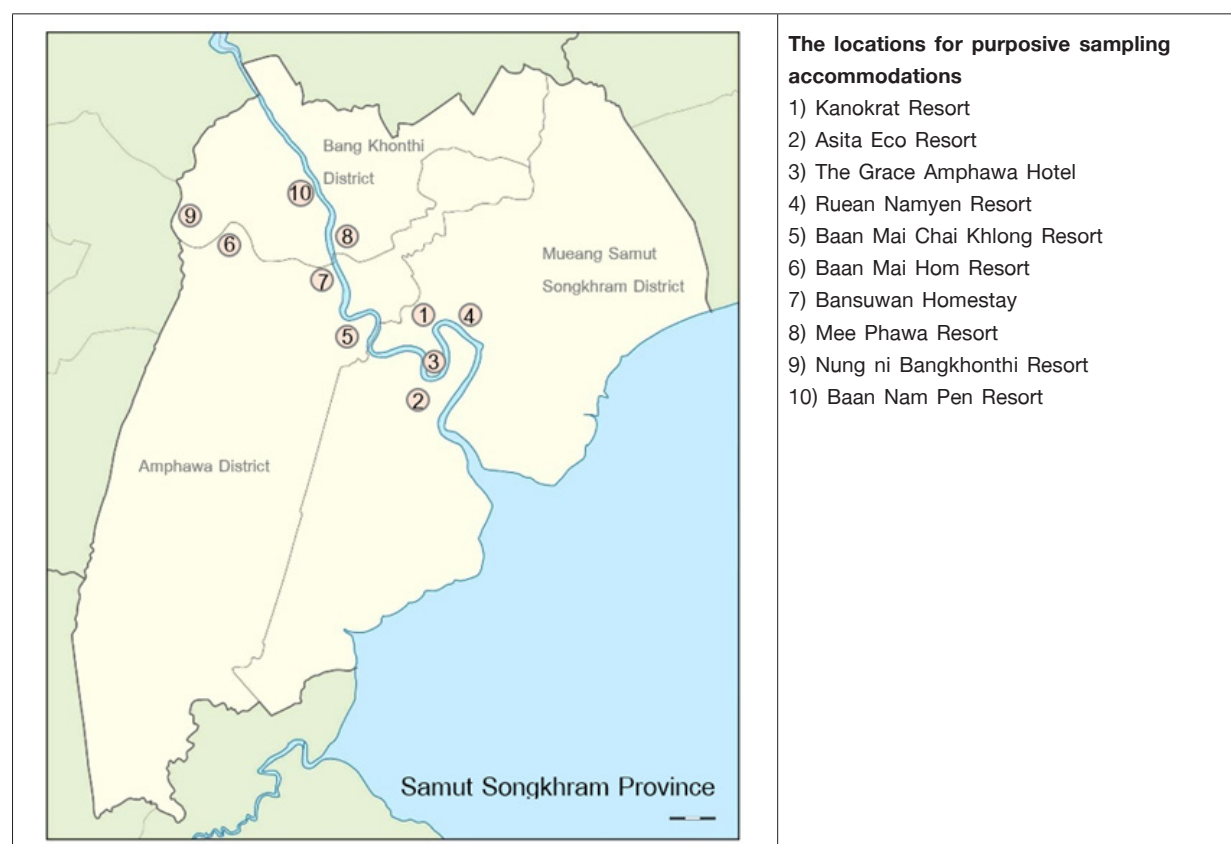


Figure 3. The locations for purposively sampled accommodations.

2) Document Collection and Review: Collect and review relevant documents regarding riverside bungalows for older people to use as criteria for evaluation according to two standards:

2.1) Standards for Facilities for the Elderly and Disabled:

- 1) Ministerial Regulation on Facilities for Persons with Disabilities and the Elderly, BE 2548
- 2) Ministerial Regulation on Facilities for Persons with Disabilities and the Elderly (No.2), BE 2564
- 3) Universal Design Guidelines by the Association of Siamese Architects under the Royal Patronage and the Health Promotion Foundation (Thai Health)

2.2) Hygiene and Safety Standards for Hotels and Accommodations:

- 1) Amazing Thailand Safety and Health Administration (SHA) standards by the Ministry of Tourism and Sports, the Tourism Authority of Thailand (TAT), and the Ministry of Public Health
- 2) Disease prevention and control measures for elderly care facilities to prevent and control COVID-19, issued by the Department of Health Service Support, Ministry of Public Health

4. Results

Ten riverside bungalows in Samut Songkhram province have upgraded their physical environment, hygiene, and safety standards for elderly tourists. These establishments include Kanokrat Resort, Asita Eco Resort, The Grace Amphawa Hotel, and Ruean Namyen Resort, all located in Mueang Samut Songkhram District; Baan Mai Chai Khlong Resort, Baan Mai Hom Resort, and Bansuwan Homestay in Amphawa District; and Mee Phawa Resort, Nung Ni Bangkhonthei Resort, and Baan Nam Pen Resort in Bang Khonthei District.

4.1 Surveying and Collecting Existing Primary data in Accommodations

First, we collected general data using questionnaires administered at ten existing accommodations, focusing on the physical environment, facility management, and emergency equipment for supporting elderly individuals. The questions were developed based on criteria for evaluation derived from two standards: the Standards for Facilities for the Elderly and Disabled, and the Hygiene and Safety Standards for Hotels and Accommodations. The results of the questionnaire are shown in Table 1. A summary of the findings indicated that the location of riverside bungalows is ready for accessibility, air ventilation, lighting, hygiene, and safety for the elderly. However, the layout and facilities inside the rooms and emergency equipment are not ready for elderly people. Most buildings are not ready, especially the bathrooms in residential rooms. It was found that 100% of the surveyed resorts did not install emergency call signals in the bathrooms and there were no handrails from the door to the toilet and shower area. Furthermore, 80% of the shower areas were not ready. The shower area should consist of a shower seat no higher than 45 cm from the floor and have handrails on the sides of the seat to help support the body. The shower faucet should be a lever or rotating type. When considering safety standards, it was found that 100% were not ready to prepare at least 1 AED in a clearly visible location. In addition, 70% did not have emergency call devices such as bells, or bells and alarms. It was found that 50% of the resorts did not provide training for operators and staff related to fire prevention, suppression, and resuscitation at least once a year.

Table 1. Surveying the physical environment, facility management, and emergency equipment in bungalows.

Surveying the Physical Environment, Facility Management, and Emergency Equipment in Bungalow	Readiness (Satisfactory) (Percent)	Rediness (not Satisfactory) (Percent)
1.1 Located in a safe location and environment that is not harmful to health, with convenient entrance and exit.	100.00	0.00
1.2 The building must operate in accordance with the law on the control of hotel, accommodation, resort buildings, with buildings, locations, and environments that support service recipients.	100.00	0.00
1.3 Areas providing services both inside and outside the establishment.	100.00	0.00
1.4 There must be a service unit to coordinate, report warnings, provide convenience, etc.	100.00	0.00

Surveying the Physical Environment, Facility Management, and Emergency Equipment in Bungalow	Readiness (Satisfactory) (Percent)	Rediness (not Satisfactory) (Percent)
1.5 There is proper management of waste, garbage, and wastewater.	100.00	0.00
1.6 There is a system for vector control based on sanitary principles.	100.00	0.00
1.7 The service area must have adequate lighting and ventilation and be free from musty odors.	100.00	0.00
1.8 Bathroom in the elderly room has the following characteristics:		
(a) The door is an outward opening or sliding type, with a net width of at least 90 cm, a lever or push handle, and can be opened from the outside.	70.00	30.00
(b) The bathroom surface level is smooth and even, not slippery, and there is no water retention.	100.00	0.00
(c) Sit-flat type toilet not more than 45 cm from the floor, has a backrest, and has a handrail close to at least one wall for support.	70.00	30.00
(d) The sink should be no higher than 80 cm from the floor. There should be a handrail next to the sink to help support the elderly while standing. The faucet should be a lever, rotating lever, or automatic system.	50.00	50.00
(e) Shower area: The shower seat must be no higher than 45 cm from the floor. There are handrails on the sides of the seat to help support the elderly. The shower faucet must be a lever or rotating type.	20.00	80.00
(f) An emergency alarm is located in the bathroom.	0.00	100.00
(g) There is a safe hot water system.	100.00	0.00
(h) There are handrails from the door to the toilet and shower area.	0.00	100.00
1.9 Wiring is organized, uses the correct type of wire, and adheres to the following safe electrical usage guidelines:	100.00	0.00
(a) Switches and wiring are maintained in good condition and safe.	100.00	0.00
(b) Has lines or boundaries to indicate areas that may be dangerous or prohibited.	30.00	70.00
(c) There is a power cut-off device in case of electric shock or leakage.	100.00	0.00
(d) Electrical lighting system: There are light bulbs installed in the sleeping area, bathroom, and general living areas.	100.00	0.00
1.10 Furniture must be safe to use and not cause danger. If there are sharp corners, they must be equipped with shock absorbers, unless it is a medical device.	0.00	100.00
Item 2: Characteristics of the establishment: A single-storey riverside accommodation building that is a place for overnight stays for the elderly.		
2.1 The service area both inside and outside the establishment must have a walkway width of at least 90 cm if using a wheelchair.	70.00	30.00
2.2 The service recipient's residence must be free from nuisances that may disturb their comfortable living.	100.00	0.00
2.3 There must be a service unit to coordinate, report warnings, provide convenience, etc. 24 hours a day.	100.00	0.00
2.4 Service areas both inside and outside the establishment:	100.00	0.00
(a) There must be a width between the beds of not less than 90 cm.	100.00	0.00
(b) The width of the walkway, if a wheelchair is used, must not be less than 90 cm.	100.00	0.00
Category 2 Safety Standards		
Section 1 General Safety Characteristics are as Follows:		

Surveying the Physical Environment, Facility Management, and Emergency Equipment in Bungalow	Readiness (Satisfactory) (Percent)	Rediness (not Satisfactory) (Percent)
1.1 Provide a first aid kit and first aid procedures in the workplace.	100.00	0.00
1.2 Provide signs or messages to display warnings or install protective devices to prevent danger to service recipients.	80.00	20.00
1.3 Provide an appropriate infection prevention and control system.	100.00	0.00
1.4 There is a fire alarm system and at least one fire extinguisher is installed in a clearly visible location. In the case where there is a service area on more than one floor, at least one fire extinguisher must be installed in a clearly visible location on each floor.	100.00	0.00
1.5 Install backup lighting systems along walkways.	100.00	0.00
1.6 Provide training for operators and employees involved in fire prevention and suppression once a year.	50.00	50.00
1.7 Personnel must be trained in cardiopulmonary resuscitation (CPR) and must practice at least once a year.	50.00	50.00
Section 2 Safety in a single-storey riverside accommodation establishment that is a residential area for the elderly.		
2.1 There are emergency signal equipment such as bells, bellsand alarms.	30.00	70.00
2.2 Have at least one external defibrillator (AED) placed in a clearly visible location.	0.00	100.00

4.2 Evaluation Standards to be used as Guidelines for Designing and Improving Single-Storey Riverside rooms for Elderly Tourists in Hotels and Accommodations

Based on the collection and review of documents to be used as evaluation criteria for the two systems:

1. Building facilities requirements for the elderly and everyone
 2. Health and safety standards for hotel and accommodation operators
- we summarize requirements in Table 2.

Table 2. Requirements and standards related to hotel and accommodation rooms for senior tourists.

Topic	Building Facilities Requirements for the Elderly and everyone	Health and Safety Standards for Hotel and Accommodation Operators
1. Number of rooms		
- Number of rooms	1. The hotel building must provide a room for the disabled and elderly, not less than 1 room per floor (2). 2. In the case where the hotel is a single-storey building with no more than 10 rooms, there must be at least 1 room for the disabled and elderly (2). 3. In the case where the hotel is a single-storey building with more than 10 rooms, there must be 1 room for the disabled and elderly for every additional 10 rooms. A fraction of 10 is counted as 10 rooms (2).	N/A
2. Bedroom		
2.1 Bedroom size	N/A	N/A
2.2 Width of walkways in buildings	Width not less than 90 cm (3).	N/A

Topic	Building Facilities Requirements for the Elderly and everyone	Health and Safety Standards for Hotel and Accommodation Operators
2.3 Bedside width	Width not less than 90 cm on at least one side (3).	The width between the beds is not less than 1 m (7).
2.4 Height level	N/A	N/A
2.5 Floor materials	N/A	N/A
2.6 Bedroom door		
- Door size	Width not less than 86 cm (2), width not less than 90 cm (4).	N/A
- Door equipment: Vertical door handles, twist or push rods, knobs, handrails	1. Door opening and closing devices must be of the twist or push type, not less than 1-1.2 m high (1). 2. Vertical door handles, the lower end not exceeding 80 cm and the upper end not less than 1 m high (1), (3). 3. Horizontal handrails, not less than 80-90 cm high from the floor (1), (4).	Create QR Code instead of using key card (5), (6).
- Different floor levels	The floor must be at the same level as the outside floor. If there is a different level, there must be a ramp with a height not exceeding 1.3 cm and both edges must have a slope not exceeding 1:2 (2), with a slope not exceeding 45 degrees or 1:1 (3).	N/A
- Kick plate	There should be a kick plate at the bottom of the door, 30-40 cm high, the full width of the door (3).	N/A
2.7 Furniture		
- Bed, pillows, cabinet or shelf	N/A	N/A
- Table	Height 75-80 cm (4).	N/A
2.8 Electrical appliances		
- Television, telephone, refrigerator	N/A	N/A
2.9 Other facilities		
- Alarm button	Height 25-95 cm, sound level not exceeding 120 decibels, push button or touch button (3), height 80-90 cm (4).	N/A
- Signs/symbols	N/A	Provide signs showing advice and guidelines for service users on preventing the spread of disease (5), (6), (7).
- Water	N/A	1. Separate other service sets for tourists or individual users, such as towels, glasses, coffee cups, etc., to prevent contact and sharing of items. 2. Prepare cloth masks or surgical masks and alcohol or alcohol gel of at least 70%. (6), (7).
- Coffee, tea, etc.	N/A	
- Glass	N/A	
- Trash can	N/A	Provide trash cans with lids. Trash, waste, toilet paper, and used face masks are properly disposed of (5).

Topic	Building Facilities Requirements for the Elderly and everyone	Health and Safety Standards for Hotel and Accommodation Operators
3. Bathroom		
3.1 Size	There is a free space for rotation, diameter 1.50 m (1).	N/A
- Separate bathroom and toilet	N/A	N/A
- Shared bathroom and toilet	The free space has a diameter of not less than 1.5 m (4).	N/A
3.2 Height level	N/A	N/A
3.3 Bathroom floor materials	Flooring materials must be non-slip (1).	N/A
3.4 Bathroom door	The door of the room where the toilet is located must be a sliding door or a door that opens outward and must be able to remain open at least 90 degrees. There must be a horizontal handrail and a disabled person symbol attached to the front door of the toilet room (2).	N/A
- Size	Width not less than 86 cm (2), width not less than 90 cm (4)	N/A
- Door equipment: Vertical door handles, twist or push rods, knobs, handrails	<ol style="list-style-type: none"> 1. Door opening and closing devices must be of the twist or push type, not less than 1-1.2 m high (1). 2. Vertical door handle, the lower end not exceeding 80 cm and the upper end not less than 1 m high (1), (3). 3. Horizontal handrail, not less than 80-90 cm high from the floor (1), (4). 	N/A
- Different floor levels	The floor must be at the same level as the outside floor. If there is a different level, there must be a ramp with a height not exceeding 1.3 cm and both edges must have a slope not exceeding 1:2 (2), with a slope not exceeding 45 degrees or 1:1 (3).	N/A
3.5 Sanitary ware and bathroom equipment		
3.5.1 Washbasin	<ol style="list-style-type: none"> 1. There must be an empty space under the sink on the side that is connected to the wall to the edge of the sink so that a wheelchair can fit in. The edge of the sink must be at least 45 cm away from the wall and must be in a position that the disabled or handicapped and the elderly can approach without obstacles (2). 2. Not less than 75-80 cm high (4). 3. There must be a horizontal, foldable handrail on both sides of the sink (2). 	N/A
- Tap	Lever type or push handle or rotary handle or automatic (1), (2), (3). Lever type or wipe handle or automatic (4)	N/A
- Mirror	No more than 1 m above the ground, tilted at an angle of 10-20 degrees (4).	N/A
3.5.2 Sanitary ware	The toilet bowl is not less than 40-45 cm high (1), (2) (4).	N/A
- Bidet hose	Height not less than 0.55-1.20 m (4).	N/A
- Toilet paper holder	Height not less than 0.55-1.20 m (3).	N/A

Topic	Building Facilities Requirements for the Elderly and everyone	Health and Safety Standards for Hotel and Accommodation Operators
- Horizontal handrail	Not less than 65-70 cm high from the floor. Protects the toilet bowl edge 25-30 cm (1), (2).	N/A
- Vertical handrail	The lower end is not less than 65-70 cm high and not less than 60 cm long (1), (2).	N/A
- L-shaped handrail	It has a length of not less than 60 cm, a height of 65 - 70 cm, and a vertical rail of not less than 60 cm (4).	N/A
- Foldable handrail	Not less than 65-70 cm high from the floor, not less than 55 cm long, not less than 15-20 cm away from the edge of the toilet bowl (1), (2).	N/A
- Other handrails	Not less than 80-90 cm in height (2)	N/A
3.5.3 Shower	Width not less than 1.10 m Length not less than 1.20 m (1), (4).	N/A
- Shower	Must have a cable length of not less than 1.5 m. (3), and a height of not more than 1.20 m. (4).	N/A
- Shower faucet	Height not less than 0.95-1.20 m (3).	N/A
- Shower seat	Not less than 45-50 cm in height (1), (3), (4).	N/A
- Horizontal handrail	Not less than 65-70 cm in height (1).	N/A
- Vertical handrail	It has a length extending from the horizontal handrail upwards of at least 60 cm (1).	N/A
- L-shaped handrail	It is 65-70 cm long, 60 cm high, and the vertical handrail is not less than 60 cm long (4).	N/A
- Soap holder	Not less than 0.30 m high from the ground and not more than 1.20 m high (1), (4).	N/A
3.5.4 Bathtub		
- Vertical handrail	The lower end is not less than 65-70 cm high and not less than 60 cm long (1), (3), (4).	N/A
- Horizontal handrail	Not less than 65-70 cm high from the floor or as long as the shower room wall (1). Not less than 85-90 cm high from the floor (3), at the end of the vertical handrail, and as long as the shower room wall (4).	N/A
3.5.5 Other equipment		
- Soap	N/A	1. Separate other service sets for tourists or individual users, such as towels, glasses, coffee cups, etc., to prevent contact and sharing of items. 2. Prepare cloth masks or surgical masks and alcohol or alcohol gel of at least 70% (6), (7).
- Shampoo	N/A	
- Towel	N/A	
- Flannel	N/A	
- Hand towel	N/A	
- Bathrobe	N/A	
- Shower cap	N/A	
- Clothes hangers, slippers	N/A	N/A
- Trash can	N/A	Provide trash cans with lids. Trash, waste, toilet paper, and used face masks are properly disposed of (5).

Topic	Building Facilities Requirements for the Elderly and everyone	Health and Safety Standards for Hotel and Accommodation Operators
4. Balcony	N/A	N/A
5. Electrical and lighting systems		
5.1 Light	N/A	N/A
5.2 Light switch	Not less than 90 cm in height and not more than 1.20 m in height (3).	N/A
5.3 Power plug	Not less than 40 cm in height and not more than 1 m in height (3).	N/A
6. Ventilation and air conditioning		
6.1 Bedroom and bathroom ventilation vents	N/A	N/A
6.2 Air conditioner	N/A	Adjust the position of the air conditioner in every room to ensure proper air circulation (5).
7. Fire system		
7.1 Fire extinguisher	N/A	N/A
7.2 Fire alarm equipment		
- Heat detection equipment	Installation height not exceeding 4 m (3).	N/A
- Smoke detectors	For residential buildings, smoke detectors should be installed. In the case of buildings with no more than 3 floors, a type called a built-in smoke detector and alarm device (3) can be used.	N/A
7.3 Fire escape signs and diagrams	There is a tactile map showing the location of the room, fire escape, and the direction to the fire escape. It is attached at the center of the inside door and is not less than 1.30 m but not more than 1.70 m above the floor. (2).	N/A

Source:

- (1) Ministerial Regulations on Facilities in Buildings for the Disabled or Handicapped and the Elderly B.E. 2548 (2005)
- (2) Ministerial Regulations on Facilities in Buildings for the Disabled or Handicapped and the Elderly (No.2) B.E. 2564 (2021)
- (3) Recommendations for Designing Facilities for Everyone (The Association of Siamese Architects under Royal Patronage, 2014)
- (4) Universal Design Guide book (Charuthat, 2015)
- (5) Checklist for evaluating sanitary safety standards in establishments, types of hotels and accommodations. Meeting Venue (SHA) (Ministry of Tourism and Sports, 2020)
- (6) Guidelines for Compliance with Business Respite Measures and Tourism Activities to Prevent the Spread of Coronavirus Disease 2019 (COVID-19): Guidelines for Business Owners/Service Providers/Users (Department of Tourism, (2020)
- (7) Preventive and Disease Control Measures for Elderly and Dependency Care Businesses: Preventing and Controlling the Outbreak of Coronavirus Disease 2019 (COVID-19) (Ministry of Public Health, Department of Health Service Support, 2020)

4.3 The Evaluation results of Single-Storey Riverside rooms Related to the Building Facilities Requirements for the Elderly and Everyone and the Hygiene and safety Standards for Hotel Accommodation Operators. The room Renovation Guidelines can be divided into two types:

- 1) Rooms that can be used by wheelchairs for the elderly, including Baan Mai Chai Khlong Resort, Kanokrat Resort, Baan Mai Hom Resort, Baan Suwan Homestay, Mee Pawa Resort
- 2) Rooms that cannot be used by wheelchairs (Non wheelchair targeted), suitable for the elderly who use canes to support themselves or walk by themselves, including Asita Eco Resort, Nai Nung Kon Tee Resort, The Grace Amphawa Hotel, Ruean Nam Yen Resort Amphawa, Baan Nam Pen Resort

Since the Ministerial Regulation on Building Facilities for the Disabled or Handicapped and the Elderly B.E. 2548 has specified that there must be a space inside the toilet room so that wheelchairs can turn around, with a diameter of not less than 1.50 m, this has impacted the renovation of original bathrooms. Often, it is physically difficult to expand the bathroom because it will affect the usable area and other systems.

1) Wheelchair-accessible resort

One renovation case study at **Baan Mai Chai Khlong Resort** is reported here. The location is at 20/1 Moo 5, Suan Luang Subdistrict, Amphawa District, Samut Songkhram Province, Thailand, 75110.

General information is as follows (and see Figure 4):

- Registration status: License Type 2 hotel
- Tourism accommodation standards: 2-star hotel and not participating in the SHA project
- Type of establishment: Resort is a residential building with a total of 18 rooms
- Type of surrounding environment: Located by the water and garden
- Room price: 2,000 baht (Friday-Saturday, public holidays) 1,600 baht (weekdays)
- Type of customer group: Young people, families with children, and the elderly

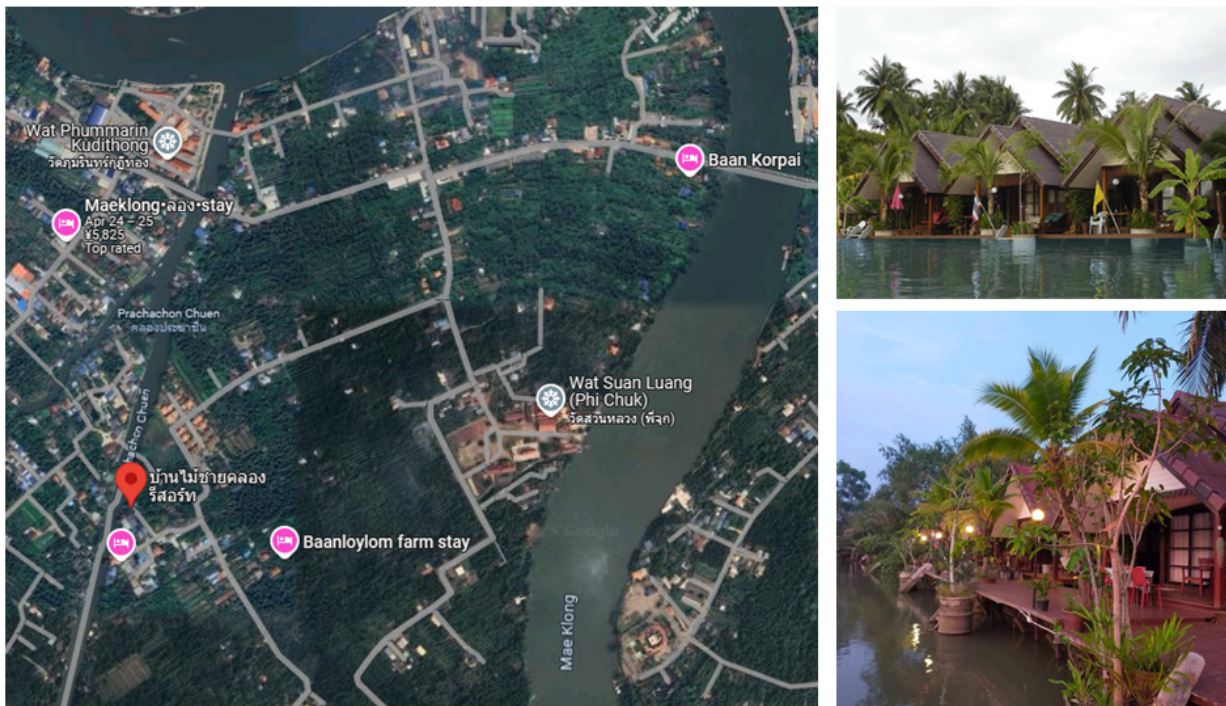


Figure 4. Case study resort (pink umbrella dot) and atmosphere.

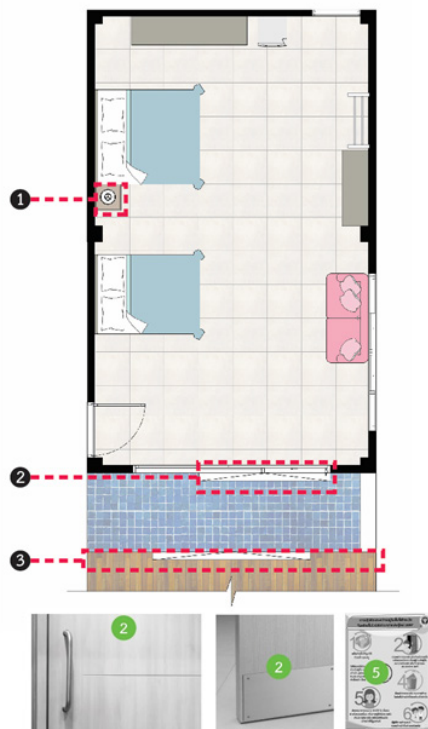
Guidelines for designing and improving the physical environment and facilities to accommodate elderly tourists of the resort are as follows (see also Figure 5):



Figure 5. Plan of the room before renovation (left) and renovation proposed (right).

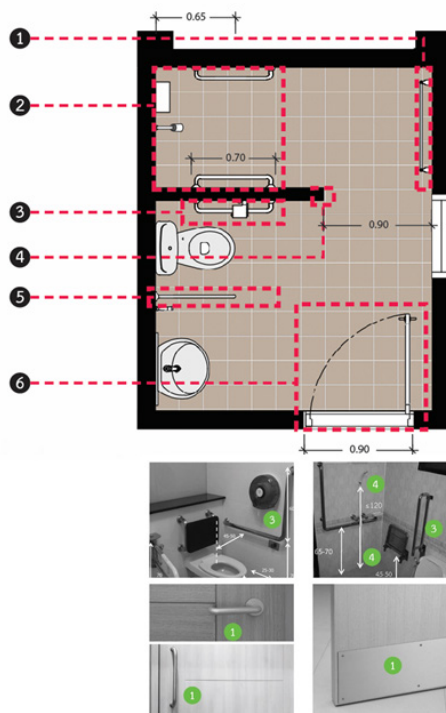
1.1) Number of rooms for the disabled and elderly: Baan Mai Chai Khlong Resort is a single-family home building with 18 rooms in total. There must be 1 room for the disabled and elderly for every additional 10 rooms. Any remainder of 10 is counted as 10 rooms. Therefore, there must be 2 rooms for the elderly in total.

1.2) Bedroom and Bathroom: Proposed renovations are as follows (see Table 3 and Figure 6 for bedroom and Table 4 and Figure 7 for bathroom details):



1	<ol style="list-style-type: none"> 1. Add a push-button emergency alarm button. 2. Add a bedside lamp to your bedside table for reading.
2	<ol style="list-style-type: none"> 1. Add a vertical door handle, the lower end no more than 80 cm and the upper end no less than 1 m high, or a horizontal handrail no less than 80-90 cm high from the floor. 2. Change the door opening and closing device to a twist or push rod type. 3. Add kick plate sheet.
3	<ol style="list-style-type: none"> 1. Change the room door to a QR code system or clean the key every time before handing to the guest. 2. Add vertical door handles both inside and outside. 3. Adjust the floor to be at the same level as the outside floor. The floor level difference must not be more than 1.3 cm.
4	<ol style="list-style-type: none"> 1. Adjust the floor to be at the same level as the outside floor. If the floor is at different levels, it must have a ramp with a height of no more than 1.3 cm and both sides must have a slope of no more than 1:2 or a slope of no more than 45 degrees or 1:1.
5	<ol style="list-style-type: none"> 1. Add signs showing advice and guidelines for service users to provide information in preventing the spread of disease.
6	<ol style="list-style-type: none"> 1. Change the trash can to a lidded one.

Table 3 (Right) and **Figure 6** (left). Proposed renovations for wheelchair room type: Bedroom



1	<ol style="list-style-type: none"> 1. Change the bathroom door to an outside opening type that can be opened at least 90 degrees and must have a horizontal handrail and a disabled person symbol attached to the bathroom door. 2. Change the door size to a width of at least 86-90 cm. 3. Change the door opening and closing device to a twist or push rod type. 4. Add kick plate sheet.
2	<ol style="list-style-type: none"> 1. Adjust the height of the sink to no more than 80 cm. 2. Adjust the height of the mirror to a height not exceeding 1 m.
3	<ol style="list-style-type: none"> 1. Add a push button alarm box, which is a button with a rope for use when falling. 2. Add a foldable grab bar that is at least 55 cm long and installed 15-20 cm away from the edge of the toilet bowl. 3. Add an L-shaped handrail which should be at least 60 cm long horizontally, 65-70 cm high from the floor, and a vertical handrail at least 60 cm long. 4. Move the toilet paper holder.
4	<ol style="list-style-type: none"> 1. Add horizontal handrails on both sides, height not exceeding 65-70 cm. 2. Adjust the height of the shower head to a height not exceeding 1.20 m. 3. Move the soap dispenser to the same side as the shower head. 4. Add an L-shaped handrail in the shower area. 5. Add a shower seat with a height of at least 45-50 cm.
5	<ol style="list-style-type: none"> 1. Reduce the length of the wall to increase the width of the walkway. The width should not be less than 90 cm.
6	<ol style="list-style-type: none"> 1. Adjust the height of the clothes hanger to a height not exceeding 1.20 m.

Table 4 (right) **Figure 7** (left). The proposed renovations for wheelchair room type: Bathroom.

1.3) Example of cost assessment of room renovation for the elderly, based on the assessment of rooms in hotels and accommodations related to the requirements for building facilities for the elderly and everyone and the safety and hygiene standards for hotel and accommodation operators:

The price of materials and labor used in the price assessment of renovation of rooms in hotels and accommodations was based on the price list of construction materials and labor costs for fiscal year 2021, Ministry of Education.

1) Baan Mai Chai Khlong Resort is a single-family home building with a total of 18 rooms. There must be 1 room for the disabled and elderly for every 10 additional rooms. The remainder of 10 are counted as 10 rooms. Therefore, there must be a total of 2 rooms for the elderly.

2) Cost assessment of room renovation at Baan Mai Chai Khlong Resort (price per room) is summarized in Table 5.

Table 5. Cost assessment table of room renovation for elderly tourists at Baan Mai Chai Khlong Resort (price per room).

PROJECT		Average price						
Item	Renovation of guest rooms at Baan Mai Chai Khlong Resort	Amount	Unit	Material prices		Labor cost		Total price (Baht)
				Per unit (Baht)	Total (Baht)	Per unit (Baht)	Total cost (Baht)	
1	Room renovation work							
1.1	The floor surface is tiled on the ramp at different levels	1.00	Sq.m.	350.00	350.00	158.00	158.00	508.00
1.2	Install the door kick plate	2.00	Set	1,000.00	2,000.00	120.00	240.00	2,240.00
1.3	Install stainless steel handrails on the door panels	2.00	Set	800.00	1,600.00	70.00	140.00	1,740.00
1.4	Install a bedside/bathroom emergency alarm push button box	2.00	Set	3,500.00	7,000.00	120.00	240.00	7,240.00
1.5	Bedside table set	1.00	Set	4,500.00	4,500.00	70.00	70.00	4,570.00
1.6	Table lamp set	1.00	Set	1,500.00	1,500.00	70.00	70.00	1,570.00
1.7	Trash can with lid	2.00	Set	150.00	300.00	-	-	300.00
1.8	Demolish the original brick wall to expand the door (waste materials are disposed of outside)	1.50	Sq.m.	-	-	250.00	375.00	375.00
1.9	Lay glazed tiles, size 8 inches x 8 inches.	0.20	Sq.m.	302.00	60.40	158.00	31.60	92.00
1.10	Change the bathroom door set, width 90 cm	1.00	Set	8,500.00	8,500.00	2,000.00	2,000.00	10,500.00
1.11	Install foldable stainless-steel handrails	1.00	Set	3,500.00	3,500.00	70.00	70.00	3,570.00
1.12	Install L-shaped stainless-steel handrails	2.00	Set	2,500.00	5,000.00	70.00	140.00	5,140.00
1.13	Install horizontal stainless-steel handrails 75 cm	1.00	Set	1,800.00	1,800.00	70.00	70.00	1,870.00
1.14	Adjust the original clothes hanger level and reinstall it to the appropriate height	1.00	Set	100.00	100.00	70.00	70.00	170.00
1.15	Relocate the shower hose	1.00	Set	200.00	200.00	70.00	70.00	270.00

PROJECT	Renovation of guest rooms at Baan Mai Chai Khlong Resort	Average price						
Item	List	Amount	Unit	Material prices		Labor cost		Total price (Baht)
				Per unit (Baht)	Total (Baht)	Per unit (Baht)	Total cost (Baht)	
1.16	Move the soap holder	1.00	Set	100.00	100.00	70.00	70.00	170.00
1.17	Install a foldable shower seat	1.00	Set	4,000.00	4,000.00	70.00	70.00	4,070.00
1.18	Dismantle the sink (waste material is disposed of outside)	1.00	Set	-	-	140.00	140.00	140.00
1.19	Counter work, RC concrete	1.00	Set	5,000.00	5,000.00	800.00	800.00	5,800.00
1.20	Counter tiling work, size 12"x12"	1.50	Sq.m.	250.00	375.00	181.00	271.50	646.50
1.21	Install a counter-mount sink set	1.00	Set	3,500.00	3,500.00	450.00	450.00	3,950.00
1.22	Move the mirror position	1.00	Set	100.00	100.00	70.00	70.00	170.00
	Total cost			-	49,485.40	-	5,616.10	55,101.50
	Operating costs and profits						[15%]	8,265.23
	Total price							63,366.73
	VAT 7 %							4,435.67
	Total							67,802.40

Note: The researcher searched for prices from the construction material and labor price list for fiscal year 2024.

The cost estimate for improving the physical environment and room facilities of Baan Mai Chai Klong Resort is 64,802.40 baht per room. Baan Mai Chai Klong Resort must improve 2 rooms for seniors by the law specifying facilities in buildings for the disabled or handicapped and the elderly (No. 2) 2021. Therefore, the total cost estimate is 135,604.80 baht.

2) Regular resort (non-wheelchair targeted)

One renovation case study for non-wheelchair-accessible rooms suitable for the elderly who use canes or walk by themselves only,

Asita Eco Resort is reported here. The location is at 33/3 Tambon Tai Hat, Mueang Samut Songkhram District, Samut Songkhram Province, Thailand 75000.

General information is as follows (and see Figure 8):

- Registration status: License Type 3 hotel
- Tourism accommodation standards: 4-star hotel and participating in the SHA project
- Type of establishment: Resort is a row of houses and single houses, total number of rooms 23
- Type of surrounding environment: Located by the river, canals, and near roads and communities
- Room price is 3,600 baht (Friday-Saturday, public holidays) and 2,300 baht (weekdays) including breakfast
- Type of customer group: Young people, families with children and elderly, elderly people not in wheelchairs, and foreign elderly people



Figure 8. Project location (pink umbrella dot) and atmosphere of Asita Eco Resort.

Guidelines for designing and improving the physical environment and facilities to accommodate elderly tourists of the resort are as follows (see also Figure 9):

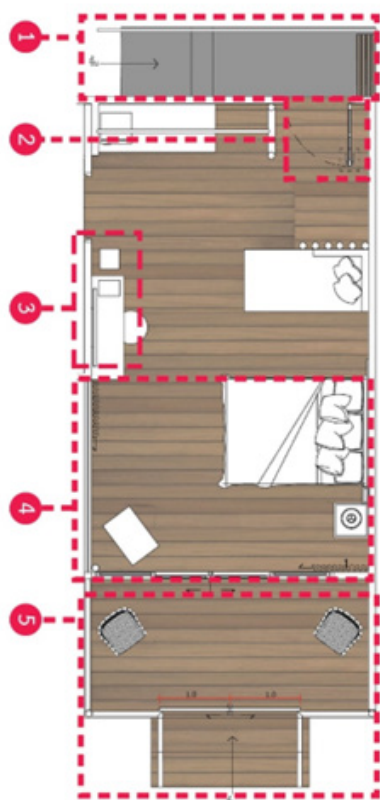
2.1) Number of rooms for the disabled and elderly

Asita Eco Resort is a single-storey building with a total of 23 rooms. There must be 1 room for the disabled and elderly for every 10 additional rooms. A fraction of 10 is counted as 10 rooms. Therefore, there must be 3 rooms for the elderly.



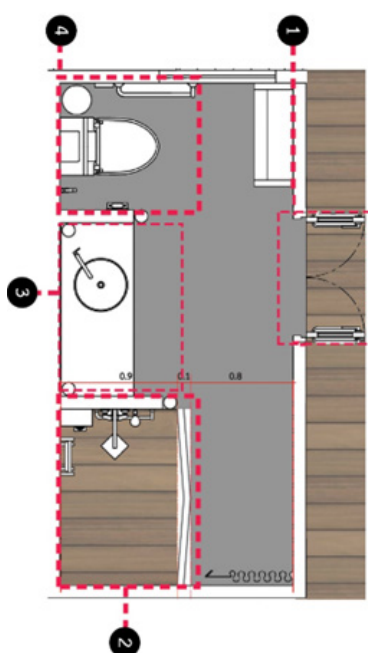
Figure 9. Plan of the room before renovation (left) and renovation proposed (right).

2.2) Bedroom and Bathroom: proposed renovations are as follows (see Table 6 and Figure 10 for bedroom and Table 7 and Figure 11 for bathroom details):



1	1. Add a handrail on the stairs. It should be round with a diameter of 3-4 cm. Made of smooth, stable, strong, and non-hazardous materials. The end of the handrail should extend from the end point no less than 30 cm and should extend parallel to the floor. The handrail should be at two levels from the floor: 70 and 90 cm.
2	1. Change the door to be at least 86-90 cm wide. 2. Change the room door to a QR code system or clean the key every time before handing to the guest. 3. Change the door opening and closing device to a twist or push rod type no less than 1.00-1.20 m high. 4. Add vertical door handles both inside and outside, the lower end not exceeding 80 cm and the upper end not less than 1 m. 5. Add kick plate sheet.
3	1. Add signs showing advice and guidelines for service users to prevent the spread of disease. 2. Change the trash can to a lidded one.
4	1. Add a push-button emergency alarm button. 2. Add a lamp to your bedside table for reading. 3. Attach a sticker to prevent people from walking into the glass. 4. Add vertical door handles both inside and outside.
5	1. Add real wood handrails, the handrails are 80-90 cm high from the floor. 2. Add sliding doors to close and open the pier and add handrails to the pier walkway.

Table 6. (Right) and **Figure 10** (left). Proposed renovations for non-wheelchair room type: Bedroom.



1	1. Change the door to an outward opening type that can be opened at least 90 degrees. 2. Change the door to be at least 90 cm wide with a lever handle. The lever handle should not less than 1.00-1.20 m high from the floor.
2	1. Add an L-shaped handrail. 2. Adjust the height of the shower head to a height not exceeding 1.20 m. 3. Change the faucet to a lever type. 4. Lower the bathroom wall by 10 cm to make the walkway 90 cm wide. 5. Adjust the floor to be at the same level as the outside floor. If the floor is at different levels, a ramp must be installed with a height of no more than 1.3 cm. 6. Add a shower seat with a height of at least 45-50 cm.
3	1. Adjust the height of the sink to no more than 80 cm. 2. Adjust the height of the mirror to a height not exceeding 1 m.
4	1. Add an L-shaped handrail at least 60 cm long horizontally, 65-70 cm high from the floor, and a vertical handrail at least 60 cm long. 2. Change the trash can to a lidded one.

Table 7 (right) and **Figure 11** (left). The proposed renovations for wheelchair room type: Bathroom.

2.3) Cost estimates for the renovations, following the same methodology as the previous case study, are summarized in Table 8.

Table 8. Table of price assessment of room renovation for elderly tourists, Asita Eco Resort (price per room).

PROJECT		Average price						
Renovation of rooms at Asita Eco Resort		Amount	Unit	Material prices		Labor cost		Total price (Baht)
Item	List			Per unit (Baht)	Total (Baht)	Per unit (Baht)	Total cost (Baht)	
1	Room renovation work							
1.1	Demolish the original brick wall to expand the door (waste materials are disposed of outside)	2.00	Set	-	-	150.00	300.00	300.00
1.2	The floor surface is tiled on the ramp at different levels	0.50	Sq.m.	350.00	175.00	158.00	79.00	254.00
1.3	Balcony/walkway railing, hardwood	1.00	m.	235.00	235.00	161.00	161.00	396.00
1.4	Balcony door, double sliding, hardwood	1.00	Set	4,500.00	4,500.00	1,000.00	1,000.00	5,500.00
1.5	Install stainless steel handrails	5.00	m.	5,000.00	25,000.00	500.00	2,500.00	27,500.00
1.6	Change the door panel width 90 cm	1.00	Set	8,100.00	8,100.00	2,000.00	2,000.00	10,100.00
1.7	Install stainless steel handrails on the door panels	3.00	Set	800.00	2,400.00	70.00	210.00	2,610.00
1.8	Change the door device to a lever type	1.00	Set	600.00	600.00	70.00	70.00	670.00
1.9	Install the door kick plate	1.00	Set	1,000.00	1,000.00	120.00	120.00	1,120.00
1.10	Install a bedside/bathroom emergency alarm push button box	2.00	Set	3,500.00	7,000.00	120.00	240.00	7,240.00
1.11	Trash can with lid	4.00	Set	150.00	600.00	-	-	600.00
1.12	Change the double door set	1.00	Set	8,500.00	8,500.00	2,000.00	2,000.00	10,500.00
1.13	Install stainless steel handrails on the bathroom door	2.00	Set	1,200.00	2,400.00	70.00	140.00	2,540.00
1.14	Change the door device to a lever type	1.00	Set	600.00	600.00	70.00	70.00	670.00
1.15	Install L-shaped stainless-steel handrails	2.00	Set	2,500.00	5,000.00	70.00	140.00	5,140.00
1.16	Install a foldable shower seat	1.00	Set	4,000.00	4,000.00	70.00	70.00	4,070.00
1.17	Change the shower faucet set to a lever type	1.00	Set	1,800.00	1,800.00	70.00	70.00	1,870.00
1.18	Relocate the shower hose	1.00	Set	200.00	200.00	70.00	70.00	270.00
1.19	Dismantle the sink counter to lower the level (scrap materials are disposed of outside)	1.00	Set	-	-	600.00	600.00	600.00
1.20	Dismantle the sink	1.00	Set	-	-	100.00	100.00	100.00

PROJECT	Renovation of rooms at Asita Eco Resort	Average price						
Item	List	Amount	Unit	Material prices		Labor cost		Total price (Baht)
				Per unit (Baht)	Total (Baht)	Per unit (Baht)	Total cost (Baht)	
1.21	Move the mirror position	1.00	Set	100.00	100.00	70.00	70.00	170.00
1.22	Counter work, reinforced concrete, polished surface	1.00	Set	2,500.00	2,500.00	800.00	800.00	3,300.00
1.23	Install the original sink set	1.00	Set	-	-	450.00	450.00	450.00
	Total cost				69,800.00		9,720.00	79,520.00
	Operating costs and profits						[15%]	11,928.00
	Total price							91,448.00
	VAT 7 %							6,401.36
	Total							97,849.36

Note: The researcher searched for prices from the construction material and labor price list for the fiscal year 2024.

The cost estimate for improving the physical environment and facilities in the rooms of Asita Eco Resort is 97,849.36 baht per room. Asita Eco Resort must improve the elderly rooms according to the law specifying facilities in buildings for the disabled or handicapped and the elderly (No. 2) 2021, totaling 3 rooms. Therefore, the total cost estimate is 293,548.08 baht.

5. Conclusions

From this study, the following conclusions can be drawn:

1. The redesign and cost estimates for room renovations revealed that rooms unsuitable for wheelchair users primarily are designed for elderly individuals who use a cane or can walk independently. These rooms have limitations in terms of space dimensions, both in the rooms and bathrooms, making it difficult to install support equipment. In some cases, expanding the bathroom space may be necessary to accommodate the installation of elderly assistive devices. This leads to higher renovation costs for rooms unsuitable for wheelchair users, often exceeding the costs of renovating wheelchair-accessible rooms. Therefore, if the renovation costs approach those of new construction, it is recommended to build additional rooms specifically for elderly users, which may be cheaper or equivalent in cost to the renovation.

2. After surveying the riverside bungalow rooms, it was discovered that the bathrooms are not well-equipped for elderly individuals. Specifically, there are no emergency call signals in the bathrooms and grab bars for support near the toilet and shower area. Additionally, the shower faucets are of the lever or knob-operated type, which may not be suitable for elderly use.

3. One Automated External Defibrillator (AED) should be installed in the common areas of the riverside bungalows. In addition, training for staff and personnel in cardiopulmonary resuscitation (CPR) and fire prevention and suppression must be conducted at least once a year.

Improving the environment within riverside accommodations for general activities, where elderly individuals can participate, will encourage them to engage more outside their rooms. This will promote social interactions with people of different or similar ages, enhancing both the physical and mental health of the elderly. The

findings have benefits not only for elderly individuals but also for all hotel and accommodation guests. They also serve as guidelines for new designs. In addition to design and renovations, good maintenance is essential to ensure that the physical environment and facilities remain in optimal condition for long-term use and efficiency.

Author Contributions

Conceptualization and Resources , S.U. and P.P.; Methodology, Validation, Formal analysis, and Data Curation, K.N., P.P., and P.P.; Writing - Original Draft, K.N.; Writing - Review & Editing and Visualization; P.P., and P.P.. Project administration, K.N.. All authors have read and agreed to the published version of the manuscript.

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