Research Article

Applying the Smart City Concept to Revitalize Tourism in Cities with Valuable Sites of Cultural Environment, Natural Environment through Urban Planning Measures: A Study of Bangjakreng Subdistrict Municipality, Samut Songkhram Province

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Abstract

The smart city concept for successful urban management has been applied in several areas. Specifically, this concept has been applied to urban planning measures to revitalize tourism in valuable areas. The objectives of this study were (1) to categorize sites of cultural environment and natural resources, (2) to analyze the tourism situation, including problems and effects, (3) to analyze the situation, the components of a smart city, and people's need for smart city development, and (4) to suggest guidelines for applying the smart city concept with urban planning measures to revitalize tourism. This study applied a mixed research method, using quantitative and qualitative research methods to collect data from 370 sets of questionnaires. People's opinions were interpreted using statistical analysis with mean and standard deviation as well as summaries with the interviews (four public officers and academicians). The research methodology used were 370 sets of questionnaires as well as interviews with 4 public officers and academicians. The results revealed problems in terms of physical dimension, pollution, natural resources, public transportation connection, and public relations (PR), all of which affected tourism. The research suggested guidelines on cooperative revitalization in terms of the components of a smart city with urban planning measures, i.e., providing a plan to develop short-term and long-term infrastructures, cooperative planning to build public vehicle connective points, planning for smart pollution control management through an alarm, PR for cooperative mangrove forest revitalization through online media, issuing overlay zoning control regulations, issuing regulations to control future land use, and the integration of the compact city concept to prevent intrusion into natural resources and the environment. The results obtained can assist with the guidelines being applied in related academic affairs to revitalize tourism so that they truly conform to the context of a certain area.

Keywords: Smart city, Urban planning measure, Tourism revitalization, Cultural Environment, Natural Environment

1. Introduction

The phenomena of urbanization and expansion of the industrial sector with population transfer from rural to urban areas affect the need for infrastructures, inhabitances, and workplaces (Shamsuzzoha et al., 2021) that are excessive to be supported by urban management, including environmental problems and lower quality of life among inhabitants (Shamsuzzoha et al., 2021; Ji & Yin, 2022; Silva et al., 2018). Therefore, the smart city concept is currently used for urban management, as well as for problem-solving, developing infrastructures, particularly communication systems and public utilities, and promoting travel in urban areas as well as tourism for better efficiency (Ji & Yin, 2022; Angelidou & Stylianidis, 2020). Undoubtedly, the smart city concept is presented as a guideline for problem-solving and urban management in various urban contexts, particularly the development and revitalization of tourist attractions to drive the local economy and enhance the quality of life for local inhabitants (Ji & Yin, 2022; Correia et al., 2022).

For integration of the smart city concept to revitalize tourism sites, particularly conservation areas to maintain their local ways of life, these areas contain the values of prominent cultural environment, natural environment as famous tourist attractions in their provinces, such as Don Hoi Lot in Bangjakreng Sub-district Municipality, Samut Songkhram Province. However, it is currently undergoing sluggish tourism, with a lower number of tourists. How can we revitalize those tourist attractions, by planning to use technology for continuous and efficient management? This can reduce the effects and also reduce the destruction of valuable tourist attractions and the environment (Li et al., 2022). Even so, such revitalization must be based on a framework of urban policies in a suitable direction in order to promote urban values and quality of life among the population. For these reasons, this research used urban planning measures (Klaylee et al., 2021) as a tool to drive the implementation parallel to the smart city concept for ideal tourism development and revitalization (Sestras et al., 2020).

With all the above information, the following research question was generated: "How can the smart city concept be applied to urban planning measures to revitalize tourism in cities with valuable cultural sites and resources as well as natural environment to substantially correspond and enhance the context and value of the area?"

2. Literature review

In this research, the literature review consists of 3 parts as follows. Smart city: The content is mainly about the components of a smart city and how to apply them. Sites of cultural environment, natural environment: This part describes the values and significance of available sites, conservation, and suitable protection of tourism areas. Urban planning measures: This part describes the measures and guidelines to apply them, together with the smart city concept. The details are as follows.

Smart city: This is a development concept that relies on human capabilities and technology to drive development, with a determination to create economic, social, and environmental sustainability. Advanced technology is also used for urban management. Also, for the benefit of urban or local areas and awareness of significance and valuable resources, the importance of their values should be used to drive development (Angelidou & Stylianidis, 2020; Udomrat, 2019). A smart city refers to a concept and a new way of integrating IT and modern innovation to enhance the efficiency of services and urban management, with participation from the private and public sectors for urban development (ISO.Org, 2015; Digital Economy Promotion Agency, 2021).The smart city concept consists of 7 dimensions for development, comprising Smart Environment (A pollution-free environment with sustainable resource management, Smart Mobility (Transportation as well as travel with lower pollution and supported public services), Smart Living (Promoting good quality of life), Smart People (People's participation to think and solve urban problems), Smart Energy (Through renewable energy), Smart Economy (Promoting local economy and using technology to facilitate promoting economy), and Smart Governance (Transparent management, providing information, and listening to people) (Digital Economy Promotion Agency, 2021; Ruohomaa et al., 2019). To apply the smart city concept for revitalizing tourism, smart systems were integrated to increase tourist enticement and meet their needs (Selim et al., 2021). This can be observed from urban problems and needs. Therefore, although studies on Unmanned Aerial Vehicles (UAV) can analyze access to sites, including spatial structure analysis to revitalize tourism attractions, they still lack consideration of conformity to the law of cultural heritage conservation (Sestras et al., 2020).

Sites of cultural environment and natural environment: The contents of the research are divided as follows.Cultural environment sites include sites with artistic, cultural, historical, and archeological sites, as well as the environment around them. Temples and Bangjakreng Community are the major cultural environment sites (Office of Natural Resources and Environmental Policy and Planning, 2024; Khamwachirapithak & Khongouan, 2024). Natural resource sites and the environment or Natural environment are all available by nature, with benefits for humans. They facilitate human living. Mangrove forests and Don Hoi Lot are the major natural resources in Bangjakreng Sub-district (Khamwachirapithak & Khongouan, 2024; Charoenmahavit, 2023). Samples of relevant research are using the model to predict the change in coastal erosion and evaluate coastal revitalization via the participation of the community and beneficiaries, which suggests the establishment of local funds to support coastal revitalization and mangrove planting to prevent coastal erosion for sustainability (Saengsupavanich, 2019). Cultural and historical conservation research are applied to revitalize cities by controlling the height of high rise buildings, designing public areas to support cultural activities and environmental management to suit the value of cultural sources, and promoting participation to create and preserve the city identity (Lei & Zhou, 2022).

Urban planning measures: These are tools to promote development in accordance with the conceptual framework of a smart city, with the development guidelines conforming to the context of a certain area. The measures are divided into 4 types, i.e., (1) negative measures to control the development of the private sector, issuance of regulations, and law enforcement, (2) positive measures for management planning, area preparation, and infrastructure preparation, (3) incentive measures to be used with the private sector to promote infrastructure and public assistance development, and (4) corrective measures to compensate private landlords for the effects of negative and positive measures. (City Planning Department, 2014; Khamwachirapithak & Khongouan, 2022). Utilization should start with creating knowledge and understanding, including participation from people and the public as well as the private sector in order to create policies and cooperation. Most urban planning measures are related to tax measures, building control laws, and land use control. For example, Singapore mainly relies on public control to develop its urban structures for modern appearances. Helsinki in Finland focuses on participation from people in project design and development to create innovations together (Klaylee et al., 2021; Shamsuzzoha et al., 2021). The geographic information system (GIS) is used to analyze urban sprawl and complexity (urban entropy) for aiding system management and urban planning. (Fistola & Rocca, 2014)

3. Study area

Bangjakreng Sub-district Municipality is under the administration of Mueang District, Samut Songkhram Province, Thailand. It covers an area of 6.65 kilometers, with a population of 4,445. Most settle down along the riverbank and roadside and are the Mon. For the background of the word “Bangjakreng,” it is the name of a seaside community of the Mon in Samut Songkhram Province. The area is mostly used for agriculture and fishing, with tourism businesses, i.e., restaurants and homestays. Ports and industrial plants are also found, e.g., fish sauce plants, ice plants, frozen food plants, and processed fruit plants (Bangjakreng Subdistrict Municipality Office, 2024) as shown in Figure 1 the building use and community density, with prominent industrial plants located not far from the community.

4. Methodology

Participants and Data Collection: The research combined both quantitative and qualitative research methods, which were used to gather the opinions of 370 people (the sample group was determined using Yamane’s approach with a reliability of 95%) (Ngarmyarn, 2011).
The distribution of questionnaires was conducted using the convenience sampling method within six months. The statistical summary was shown in a mean and standard deviation to adopt as guidelines for the current smart city situation toward tourism development, improvement, and revitalization. In addition, interviews were applied and divided into three groups comprising (1) the Bangjakreng Sub-district Municipality Office, (2) the Provincial Office of Natural Resources and Environment Samut Songkhram, and (3) urban planning experts from the Department of Public Works and Town & Country Planning and urban planning professors, four in total. Interview results were analyzed by classifying and summarizing the aspects to determine any connections with other study’s results.

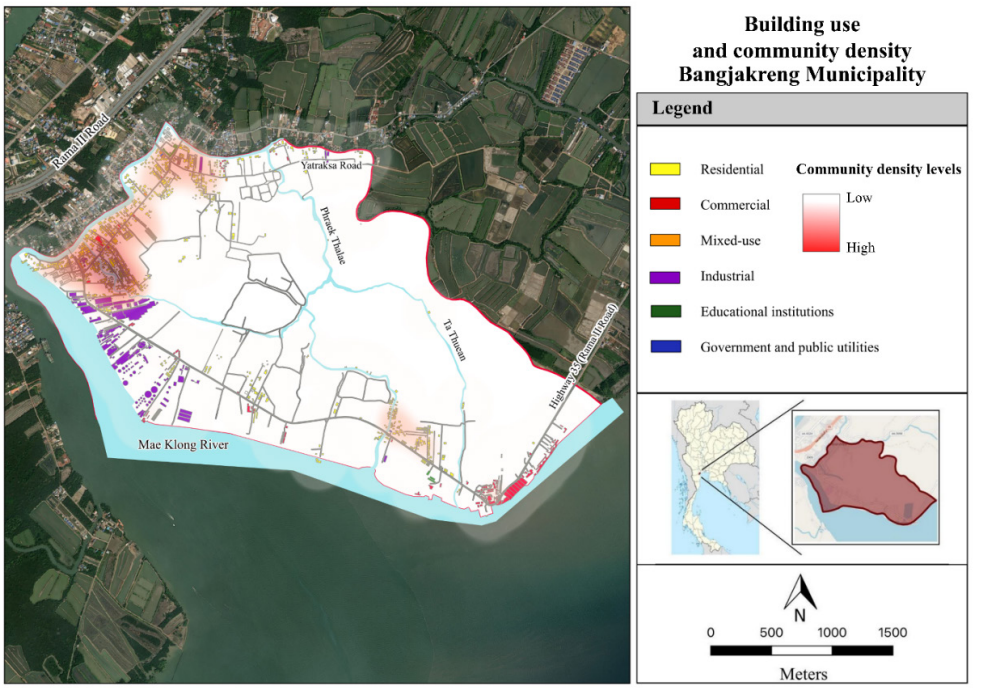

Figure 1. Building use maps overlay with community density levels. Source: Google earth image modified by the authors (2024).

Data Analysis: Primary data were analysed as follows.

1) Categorizing cultural environment and natural environment: Categorizing and identifying locations of cultural environment and natural environment in the area are based on data from the Office of Natural Resources and Environmental Policy and Planning (Office of Natural Resources and Environmental Policy and Planning, 2024).

2) Analyzing the tourism situation, problems, and effects on cultural environment and natural environment: The tourism situation, problems, and effects on the cultural environment and nature were analyzed by connecting the causes, conditions and effects from descriptive matrix analysis. The results revealed the causes and level of each particular problem, which could be connected to effects and valuable sources, in the form of spatial relationships, concentration of the community, and locations of cultural environment and nature.

3) Analyzing the situation of the components of a smart city: The situations of smart city components were categorized and analyzed corresponding with the area. The components were classified into seven dimensions based on the development dimensions of the Digital Economy Promotion Agency (2021), comprising
1) Smart Environment 2) Smart Mobility
3) Smart Living 4) Smart People
5) Smart Energy 6) Smart Economy
7) Smart Governance.

4) Analyzing the need for smart city development and awareness of values and problems: To analyze the need for smart city development obtained by the questionnaire and interview.

According to the main ideas from the reviewed literature and methodology, a research framework was set as follows. "Categorizing cultural environment and natural environment, analyzing local tourism situation and problems, categorizing and analyzing the situation of the components of smart city, and analyzing the need for smart city

development based on the completed questionnaire, the interview, and site visit would lead to applying the smart city concept with urban planning measures to revitalize tourism attractions to truly conform to the local identity and values." Figure 2 illustrates the research framework for smart city concept along with the urban planning measures to revitalize valuable sites based on the classification of the types of valuable sites, the analysis of the tourism situation as well as problems and effects, the analysis of smart city components, and the analysis of the needs for smart city development and awareness of values and problems.

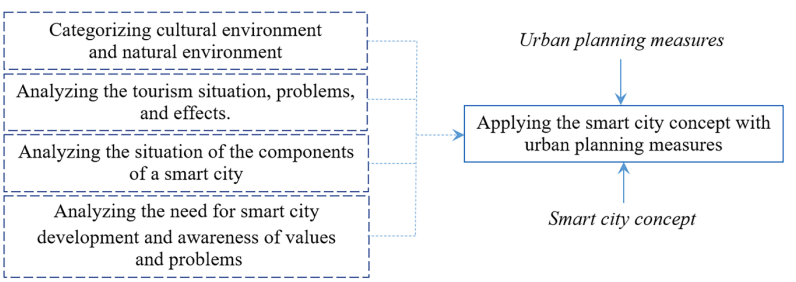

Figure 2. Research framework

5. Results

5.1 Categorizing cultural environment and natural environment.

The survey and identified sites of cultural environment, natural resources, and the environment by the Office of Natural Resources and Environmental Policy and Planning (Office of Natural Resources and Environmental Policy and Planning, 2024) can be categorized as follows. **1) Cultural environment sites**: 3 sites were found as follows. (1) Bangjakreng Community: It is an old community area. Most inhabitants are the Mon, living on agriculture and coastal fishing, settling on both sides of the Bangjakreng Canal. Their occupations and interesting products include coastal fishing, agriculture, and Mon coconut caramel. (2) Wat Bangjakreng (Wat Inthakongka): A temple with significant antiques, i.e., Mondop impressed with the simulated footprint of Lord Buddha and ancient teak ubosot with drawings that narrate the history of Lord Buddha and the history as well as the conditions of Bangjakreng. (3) Wat Sathatham: A temple located in the center of a community full of trade and services. It was once awarded for being a role model of a developed temple. The archeological sites include the junk-shaped ubosot made of teak embedded with pearls inside and outside, and the wall paintings about the history of Lord Buddha. The temple also includes the sculptures of master monks and two sculptures of Vessavana. The temple has been a famous cultural tourist attraction up to now, particularly on weekends and holidays. Most tourists come from the Amphawa Floating Market. **2) Natural resource and the environment**: 2 sites were found as follows. (1) Mangrove forests: They are areas with biodiversity found along the coast and the mouth of the river. These forests are currently undergoing degradation and a decrease in number due to modifications to the area for aquaculture, cultivation, and inhabitance. (2) Don Hoi Lot: It is a coastal wetland arising from deposited sediments of the river and the sea; the mud flats serve as habitats for razor clams and different species of birds. This area contains natural exuberance and balance with benefits for fishery, agriculture, and economic activities, particularly ecotourism and nature-based tourism. This is a well-known and famous tourist attraction at the national and international levels. (Figure3)

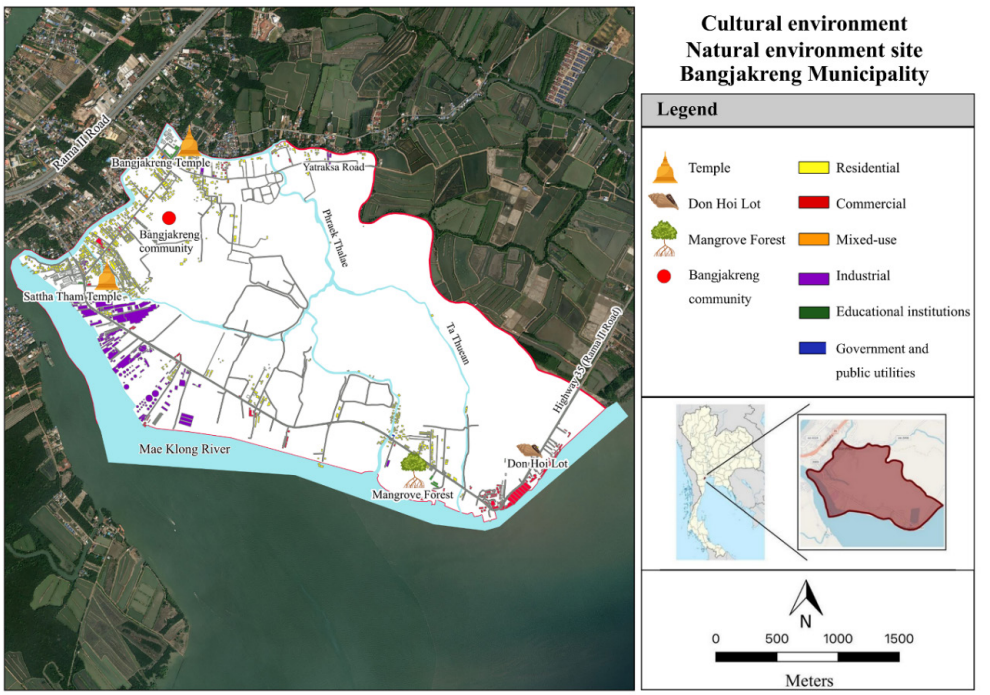

Figure 3. Cultural environment and natural environment sites. Source: Google earth image modified by the authors (2024)

5.2 Analyzing local tourism and problems:

The data in this part describes the overview of local tourism and the analysis of problems connected to valuable sites. More specifically, the analysis was based on the connected causes and effects that finally lead to problem-solving. **1) Tourism situation:** Bangjakreng Sub-district Municipality contains tourism efficiency because of its multicultural background and unique ways of life along the Mae Klong with coastal fishing, aquaculture, and developing tourism. The combined cultures of Thai inhabitants and the Mon bring unique traditions, e.g., the famous local Mon coconut caramel, Batik creations, and processed seafood. This also includes historical tourist attractions that reflect local history and original ways of life in the community, i.e., Wat Satthatham and Wat Bangjakreng. The municipality also includes natural resources and the environment, with mangrove forests and ecosystems in the wetland, e.g., Don Hoi Lot, a feature that attracts ecotourism to the province. The tourist attraction situation is shown in Figure 4 and Figure 5.

2) Local problems: Analyzing problems from causes conditions and effects to categorize the levels of problems connected to valuable sites, as in Table 1. According to causes and effects, the levels of problem can be analyzed and connected to the spatial values, as shown in Figure 6, the problems and severity levels affecting the sites of cultural environment, and the natural environment.

Figure 4
(a) Bangjakreng community,
(b) Wat Bangjakreng,
(c) Wat Satthatham and
(d) Installed shops obscure the views/scenery of the temples (Authors)

Figure 5
(a) Don Hoi Lot,
(b) Most tourists visit only during long weekends,
(c) Shops are slow on weekdays and weekends
(d) Mangrove Forest,
(e) Degenerated ecosystems and modification into an area for agriculture, habitation, and aquaculture (Authors)

Local problem	Cause	Condition	Effect
Connected public transportation	Shops are slow on weekdays and weekends, but most tourists visit only during long weekends, so they typically travel by private car, leading to heavy traffic	Insufficient parking area	Crowded areas
		Traffic congestion due to personal cars of tourists/visitors	Degraded air quality Exhaust fumes and noises
Physical dimensions	More trade activities in the temples, causing density/the crowded area.	Installed shops obscure the views/scenery of the temples.	Lower views/sceneries and values of the temples
Pollution	Released waste from buildings, houses, plants, and restaurants into the river.	The river, canals, and the sea are contaminated with toxins and sediments.	- Degenerated ecosystems of Don Hot Lot and mangrove forests - Lower number of aquatic animals, particularly cockles and razor clams.
	Released waste from buildings, houses, plants, and restaurants into the river.	Unpleasant smells of waste.	- Degenerated ecosystems of Don Hot Lot and mangrove forests. - Affected fishery and economic activities.
Natural resources	Misused fishery tools and caught too young cockles for sale.	Possible extinction of cockles and razor clams.	- Affected fishery and economic activities. - Lower number of aquatic animals, particularly cockles and razor clams.
	Modification into an area for agriculture, habitation, and aquaculture.	Lower number of mangrove forests.	- Degenerated ecosystems of mangrove forests.
Public relations (PR)	Lack of promoting tourism and PR.	Unknown cultural and natural environment sites and eco-tourist attractions.	- Lower number of tourists. - No motivation to develop tourist attractions for the better.

Table 1. Problem analysis from causes, conditions and effects related to the valuable sites.

5.3 Analyzing the situation of the components of a smart city for the needs of smart city development

5.3.1 The situation of the components of a smart city: While 175 cities from 58 provinces across Thailand are well prepared to propose the smart city development plan (Digital Economy Promotion Agency, 2021), Bangjakreng Sub-district Municipality does not have the development plan or even contain the plan in the local development plan. However, the survey on the components of a smart city in the area indicates the residence patterns and application of technology that promote the quality of life, which conforms to seven aspects of smart city components (Digital Economy Promotion Agency, 2021; Ruohomaa et al., 2019), which are: **(1) Smart Economy:** There are product sales, community economy, online PR, and technology (QR Code) for tourism. **(2) Smart Mobility:** There is a public pickup service in the area from the private sector to Don Hoi Lot. As for the community area, there are motorbike taxis and pick-up truck (songthaew) taxis. However, these services are limited and not provided as inclusive connective points to tourist attractions. **(3) Smart Living:** Online technology is used for trade, transactions, and food delivery using different platforms, e.g., Lineman and Food Panda. Even so, the coverage of free Wi-Fi provided by public agencies is still not inclusive enough. **(4) Smart Environment:** The problems of PM, toxic fumes, waste, polluted water from human activities and plants, and loss of mangrove forests can rely on technology for examination and solutions in the future. **(5) Smart Energy:** Solar cells are used in the target area. **(6) Smart People:** Local inhabitants can use social media to provide their opinions, develop their knowledge, create security, and promote quality of life by using media channels in their daily lives. **(7) Smart Governance:** Local agencies create 2-way communication channels for suitable services in order to increase convenience and ease of access.

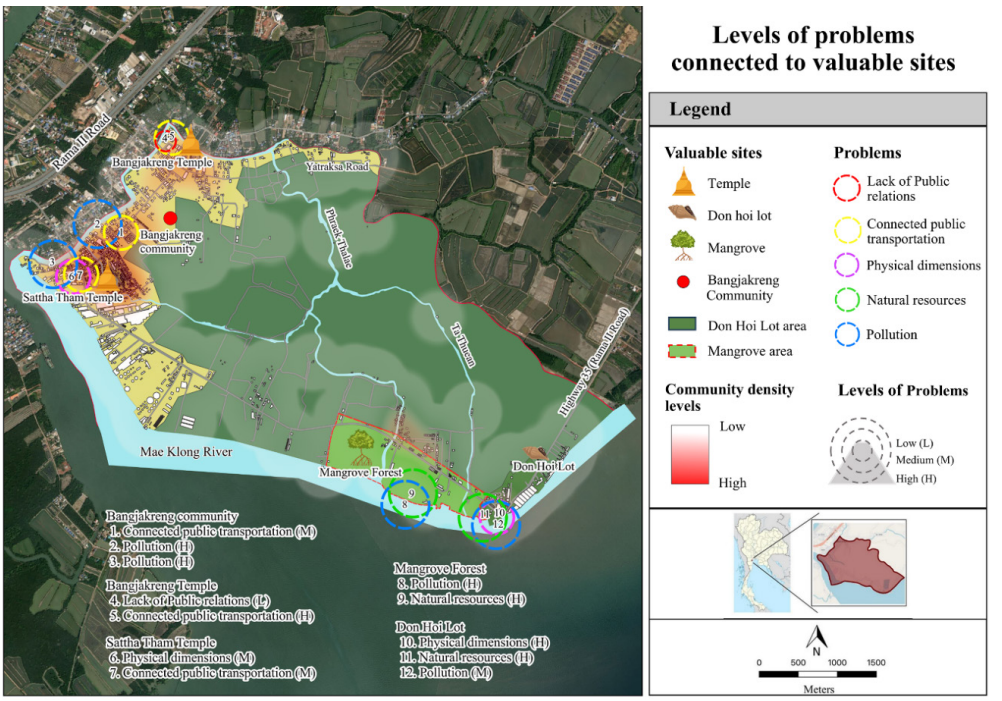

Figure 6. Level of problems related to the valuable sites. Source: Google earth image modified by the authors (2024).

Table 2. Application of smart city components, limitations, and problems

Smart city components	Application		Limitations	Problems
	Yes	No		
Smart Economy	✓		-	-
Smart Mobility	✓		- Under private sector - Insufficient and not cover the entire area - Disconnecting network	
Smart Living	✓		- Internet service is not sufficient for the entire area	-
Smart Environment		✓	-	- Air pollution from factories and tourism - Devaluation of art conservation sites - Invasion of environmental conservation areas
Smart Energy	✓		- No inclusive use	-
Smart People	✓		- Most elderly cannot use	-
Smart Governance	✓		-	-

From the above situation, the application of smart city components, limitations, and problems of each components can be summarized in Table 2.

5.3.2 Need for smart city development:

The results from the questionnaire and the interview forms were divided as follows.

Results from the questionnaire (1) The demographic data of 370 samples can be concluded in the overview as follows. Most of them were female (57.8%), aged between 35-44 years (21.4%), and were Buddhist (99.7%). Most had graduated from primary school (41.9%), worked (33.5%), and had lived in the area for ≥ 10 years (86.5%). (2) Regarding the need for smart city development, their opinions were divided into 2 sites, i.e. The need for smart city development concerned with the conservation of valuable sites for a cultural environment, nature, and the environment. The displayed levels of need were interpreted from the means (between 3.73 and 4.17) as follows.

Need for development under concern about the conservation of valuable sites of the cultural environment. According to people's opinions, their needs for the development of facilities in the city and improvement of the access system for information from the public sector were the highest ($\bar{x}$ = 4.17, SD = 0.73 and $\bar{x}$ = 4.14, SD = 0.66, respectively). People should be encouraged to participate in urban development, along with modern and safe transportation as well as traffic systems ($\bar{x}$ = 4.06, SD = 0.67 and $\bar{x}$ = 4.06, SD = 0.73, respectively). Planning is required for land use due to concerns about the value of the areas ($\bar{x}$ = 4.04, SD = 0.73). Also, their opinions toward knowledge transfer about technological innovations were high ($\bar{x}$ = 4.03, SD = 0.71). Their slightest needs included using technology for urban management, art & culture, and taking care of archeological sites and antiques ($\bar{x}$ = 3.74, SD = 0.80 and $\bar{x}$ = 3.73, SD = 0.77 respectively).

Need for development due to concerns about the conservation of valuable sites for nature environment. According to people's opinions, their needs for the development of facilities in the city and for using renewable energy, e.g., solar cells, were the highest ($\bar{x}$ = 4.16, SD = 0.73 and $\bar{x}$ = 4.12, SD = 0.71, respectively). They showed high opinions toward planning for land use due to concerns about the value of the areas, improving access to information from the public sector, promoting energy saving/eco-cars, and knowledge transfer about technology for detecting and monitoring the quality of the environment ($\bar{x}$ = 4.06, SD = 0.69 and $\bar{x}$ = 4.05, SD = 0.71 and $\bar{x}$ = 4.05, SD = 0.74 and $\bar{x}$ = 4.00, SD = 0.69, respectively). They showed moderate opinions toward the development of transportation and traffic systems in the valuable target area for a modern appearance, with convenience and safety ($\bar{x}$ = 3.97, SD = 0.73). Their slightest need included applying digital technology for urban management and the conservation of sites with natural values ($\bar{x}$ = 3.75, SD = 0.73).

Interview results with the sample group. The sample group was divided into three groups, each of which had different questions. (1) A representative from the Bangjakreng Sub-district Municipality Office, which is the government agency responsible for urban development had comments related to the application of the smart city concept in the area. The main points can be concluded as follows: Smart City Development Guidelines not included in the city development plan, application of technology in the area used QR Code, Facebook, and a public address system as tools for people to express opinions about online purchase and delivery in the area, utilization of solar cells, and garbage separation, In addition, frequent issues with technology application included no WiFi, lack of knowledge among the elderly, and low percentage of working age population. (2) A representative from the Provincial Office of Natural Resources and Environment Samut Songkhram had comments related to the conservation of cultural and natural sites. The main points can be concluded as follows: A famous tourist site in the area is Don Hoi Lot, activities at tourist sites include river cruising, and using salt to catch razor shells and the tourism situation highlights the low number of tourists and sluggish economy. However, problems include wastewater from industrial factories resulting from development projects, less participation in management, deterioration problems, inconsistent development with the current state, and insufficient manpower from the agency. (3) Urban planning experts had suggestions on questions regarding urban development using the smart city concept as follows: Key principles for adopting the smart city concept to area revitalization: determining the goals and development direction, and prioritizing the significance of each component to suit the context, values, and problems, prioritizing action in due time, including everyday life matters such as smart garbage management, highlighting participation from multiple sectors. Finally, applying urban planning measures to steer area revitalization, e.g. tax measures, land use control measures by considering the carrying capacity, buffer zone, development corresponding to the context of value, and the compact city development concept to preserve natural resources.

6. Discussion

Applying the smart city concept to drive tangible tourism revitalization in valuable sites of cultural environment, natural environment through urban planning measures is reflected in the problems, situations, people's needs, and opinions. These can be synthesized into the following guidelines.

6.1 Development guidelines on "Smart Environment, Smart Governance, Smart People"

According to the levels of vastly accumulated problems in terms of natural resources and pollution in several zones, particularly the crowded ones due to land use, i.e., the community and tourist attractions; wastewater release into natural environment site; lower mangrove forests; and destroyed ecosystems due to misuse of fishery tools. These problems require technology

for campaigns, warnings, and control of activities as well as land use through urban planning measures. According to the questionnaire, it was revealed people should be encouraged to participate in urban development. Therefore, there should be cooperation with the people, as well as private and public sectors in local and provincial agencies in terms of setting an infrastructure development plan, pollution management budget, and short-term and long-term plans for the project. For example, these can be set following people's opinions to use technology for detecting and monitoring pollution. Therefore, an activity of pollution alert system design should be provided in the community(Klayleeetal.,2021;Shamsuzzoha et al., 2021), including waste separation/ sorting, creating simple channels to notify problems to involved agencies, and PR for activity to conserve and revitalize mangrove forests such as Don Hoi Lot. Public agencies can provide a tax deduction measure for the private sector, with cooperation to solve long-term pollution problems with a monitoring system. There should also be a fund for local natural environment sites revitalization (Saengsupavanich, 2019); overlay zoning; and land use control, particularly lower mangrove forests due to turning them into inhabitances and agriculture, to set conditions of land use or for buffer zoning to prevent intrusion into mangrove forests (Figure 7).

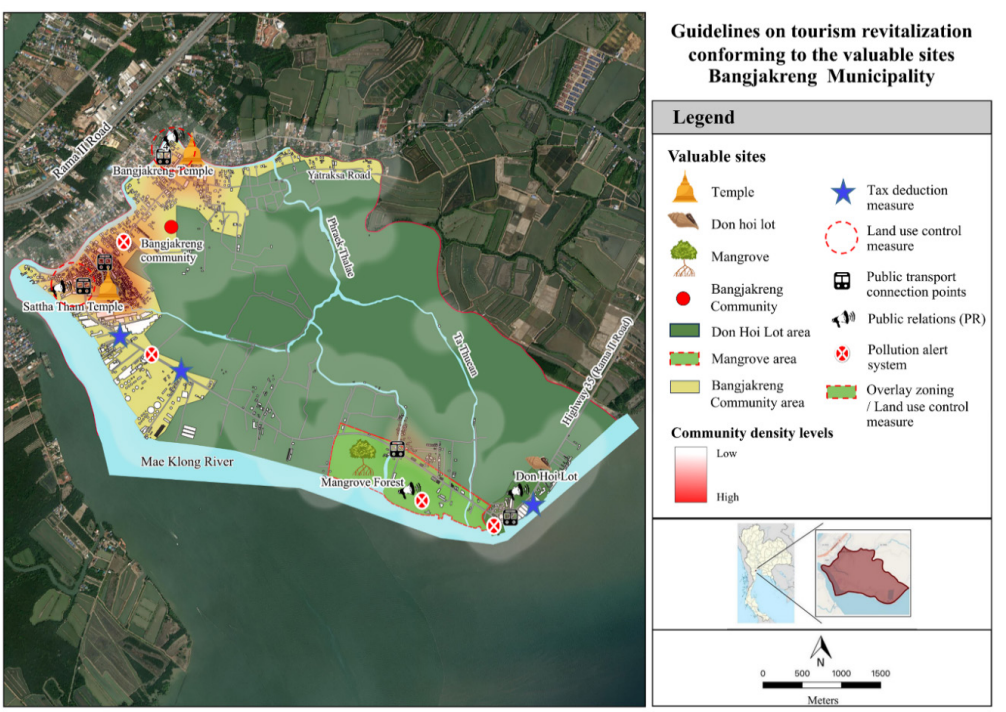

Figure 7. Applying the smart city concept with urban planning measures as spatial implementation according to the analysis of problems, situations, and the needs of smart city development to revitalize tourism attractions. Source: Google earth image modified by the authors (2024).

6.2 Development guidelines on "Smart Mobility, Smart Living, Smart Economy"

The problem must be solved, and the use of public transportation must be promoted as per people's needs at high and moderate levels by building connective points. Despite the current availability of motorbike taxis and pick-up truck taxis, the problems and answers from the interview revealed that people still use their cars for more convenience, particularly to connect to major local sites and tourist attractions. Therefore, more convenient public transportation must be promoted. Simultaneously, connective points for transportation must be built (Figure 7) for continuous travel to all connected tourist attractions, including Ban Chu Chee, an original community with highlights for dessert making and food processing to support the community economy through urban planning measures. To illustrate, there should be a cooperative infrastructure development plan, a tax deduction measure to request cooperation from the private sector to plan and build connective points throughout the routes, and the development of an application for calling public vehicles in the future despite the minimal need for these according to the questionnaire (Klaylee et al., 2021; Shamsuzzoha et al., 2021).

6.3 Development guidelines on "Smart governance, Smart people, Smart living"

A problem that causes sluggish tourism is the lack of PR. Therefore, there should be knowledge transfer and inheritance of valuable cultural and natural resources, and the environment for the community and tourists. When the community obtains knowledge with awareness of the values, it leads to possession, conservation, and suitable protection (Angelidou & Stylianidis, 2020; Udomrat, 2019). Upcoming developments and changes will be implemented with suitability and conformity, without diminishing the values of the target sites. Urban planning measures and social media will be used to publicize the revitalization of tourist attractions, e.g., mangrove planting (Figure 8), continuing the destiny of Don Hoi Lot (currently under process with cooperation from the private sector). In the long term, there should be participation from other agencies, academic collaboration, knowledge transfer, and awareness of significance as well as valuable sites of cultural environment, natural environment. In addition, due to a high public need for land use planning to conform to the values in the area means there should be regulations for activity and land use control (Figure 7), set-back regulations for activity control (Lei & Zhou, 2022) for the benefit of building/construction and future development that will neither obscure cultural environment sites nor cause loss of identity and the values of culture and history that may fail to be revitalized at last (Sestras et al., 2020; Lei & Zhou, 2022).

Figure 8. Examples of created PR media to participate in planting mangrove forests to create awareness and perceived values toward these forests.

Suggestions can be proposed as guidelines to answer the research question of how a smart city can be adapted to urban planning measures based on the integration, situation, city components, limitations, and problems with tourism by considering problems and major effects on communities. Pollution issues result from tourism and visual pollution from the development of the area surrounding the ancient remains, as shown in the samples of suggestions in Figure 9.

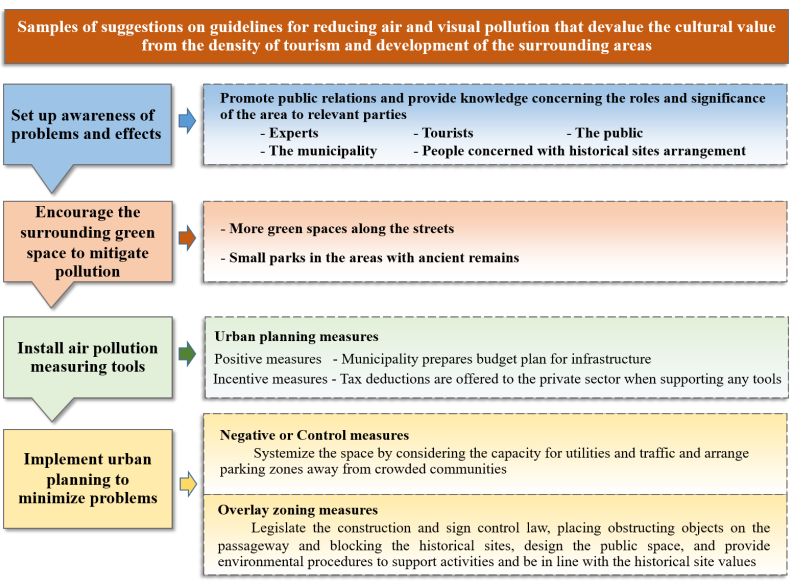

Figure 9. Samples of suggestions on guidelines for reducing air and visual pollution

7. Conclusions

Bangjakreng Sub-district Municipality contains valuable tourist attractions for cultural environment, i.e., Bangjakreng community, Wat Bangjakreng, and Wat Satthatham. Other famous attractions include Don Hoi Lot and mangrove forests, valuable areas of natural environment. The problems mentioned earlier affect tourist attractions in several dimensions. Therefore, the results of this research suggested guidelines on tourism revitalization conforming to the local context as follows. (1) Apply the concept "Smart Environment, Smart Governance, Smart people" with promoted positive measures. To clarify, the public sector prepares infrastructure development plans and budgets for short-term and long-term pollution management. There should be PR for public participation in activities; using technology for pollution management to revitalize natural environment sites; negative measures for overlay zoning, regulations to control activities, density, and guidelines on land use to prevent intrusion into mangrove forests. (2) Implementing the concept "Smart Mobility, Smart Living, Smart Economy" along with Positive Measures and Incentive Measures means the government sector should stimulate technology implementation to accommodate daily life and promote economic stimulus. Some technologies are currently in place. However, issues with internet signal access and elderly illiteracy are evident. Government agencies should demand cooperation from other sectors to organize training and enforce positive measures, as well as allocate funding for sufficient WiFi installation, plan for the infrastructure development, construct collaboration among sectors, and collaborate to develop connecting points for public transportation and public transportation service along the tourist attraction routes by offering tax deductions and using transport system promotion innovation in the future. (3) Adapting the concept "Smart Governance Smart People, Smart Living" together with Positive Measures means the government sector should prioritize cooperation with the private sector to set a budget for public relations on Don Hoi Lot environmental conservation using technology in registration and garbage collection activity, making mangrove buffer zones, and utilizing online public relations to provide knowledge. In addition, the promotion of a plan for participation is necessary, especially for the local community network and agencies, to educate and point out the significance and value of the residential area to create understanding and improve the area together to achieve accurate academic practices.

On the other hand, planning and applying technological management systems and innovation for tourism revitalization, both short-term and long-term, will lead to efficient implementation, which can be explained as follows. (1) Participation from all sectors must be targeted, along with knowledge and understanding of the significance and the context of the area. (2) The carrying capacity of each site with different values must be considered. (3) For guidelines on revitalizing each dimension, there should be a drive for land use control regulations, with the full authority of local agencies to enforce the law as the owner of the area. (4) For long-term and sustainable tourism revitalization, there should be integrated development planning with clear goals conforming to the context of values and the significance of the area. For example, the compact city concept should be applied with a policy and a plan for land use combined with the smart city concept to prevent land use that intrudes into mangrove forests as well as to prevent land use until degradation.

In terms of the limitations to data collection and tourist sites survey, it is available only on days off when people have activities and travel. For this reason, the duration of data collection from the sample group and the tourism situation survey was not a controllable factor. Finally, tourist site revitalization requires the collaboration of all sectors for legitimate benefits, including smart city components and urban development tools. For further study, an analysis of the community structure and social networks in the area is essential to acquire fundamental data for setting up the tourism restoration plan, which can help to comprehend the roles and develop the area toward long-term and sustainable tourism revitalization.

Conflict of Interest

Authors declare that there is no conflict of interest.

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CRediT Authorship Contribution Statement

Putpunnin Khamwachirapithak: Conceptualization; formal analysis; data curation; writing – original draft; supervision; funding acquisition.
Waralak Khongouan: Methodology / Study design; validation; investigation; resources; writing – review and editing; visualization; project administration

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