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Smart city development in a tourist city with valuable sites of cultural and natural environment: Case study of Amphawa Subdistrict Municipality, Samut Songkhram Province

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Abstract

The Amphawa Subdistrict Municipality is located in a riverfront community that reflects its historical heritage. With the increasing emphasis on eco-tourism, there arises a question of how the city can be developed in a way that preserves its cultural and natural value whilst embracing smart technologies to enhance urban management efficiency. The objectives of research were: (1) to study the area's valuable cultural and natural environment sites, and its readiness for smart city components, (2) to study the demands of people in the development of smart cities, and (3) to suggest guidelines for the development of a smart city corresponding with the public opinion in an area with cultural and natural values. The research methodology used were questionnaires (given to 370 people) and interview forms (five government officials and academicians). The research findings reveal that there are four cultural environmental sites and that the significant natural environment in the area is the Mae Klong River. In terms of community needs, the highest demand (mean 4.82%) is for smart governance development. The proposed development approach suggests that the municipality can seek collaboration, establish networks to utilise technology for city management, raise awareness of the value of the cultural and natural resources among the public and organisations, engage in activities with various sectors, smart temple sign, assist with planning activities in residential areas near valuable sites, implement urban planning measures such as tax measures, overlay zoning control, and designation of buffer areas should be adopted as tools to promote concrete development.

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Introduction

The way people live in cities has changed as a result of improvements in technology, which have had a significant impact on urban development. This affects the efficiency of the city administration, making it a crucial mechanism for promoting and encouraging the use of technology as a principle for city development such as planning guidelines for smart cities. This is in line with the direction of national development according to the Thailand 4.0 propulsion guidelines, the 20-year National Strategic Plan and the Digital Development Plan for the Economy and Society (Digital Economy Promotion Agency [DEPA], 2021).

Smart cities are those that use technology and innovation to optimize city management. Being a livable city requires balancing resource usage and development so that people have a good quality of life in the rapidly changing social and technological environment (DEPA, 2021; Karvonen et al., 2020; Pozoukidou & Angelidou, 2022). However, the development of a smart city must also consider the role of heritage, valuable resources, and the rich history and culture of the city, which are intertwined with its development and transformation, as studied by Cvar et al. (2020). In their research, there was a discussion of the benefits of technology that can be applied at various levels, including smart cities and smart villages, depending on multidimensional factors such as the economic context, social aspects, development policies, culture, history, and community collaboration, which are considered more important than mere technological development.

The Amphawa Subdistrict Municipality, Samut Songkhram province is a city with sites for historical artifacts. It is a waterfront town that captures the essence of the culture and way of life. Up to now, there have been some changes in the valuable characteristics of the area to support more eco-tourism (Boonthien, 2018). The changes in the city raise questions about how this area can be developed and managed, especially considering its valuable resources and its reflection of history and ancient culture. The goal is to create a smart city that utilises technology to enhance the efficiency of urban management, whilst reducing the negative external factors that may arise from tourism activities and potentially diminish the quality of life for the local population. This includes preserving the cultural identity, such as the lessons learned from the conflict between high-rise development and the cultural heritage of the two canal banks that pass through the area, ensuring that the residents have a good quality of life by leveraging the benefits of technology that are suitable for the important context of the area, with the active participation of the community.

This research article, therefore, proposes guidelines for urban development by using the concept of smart city development that is suitable for changing the area to increase management efficiency but still reflects the value of the cultural environment sites and natural resources in the area through public opinions. It is an important process of participation in the concept of smart city development. The aims are to research the available cultural environment sites, valuable natural environment sites, and the situation of readiness for smart city components, to study the demands of the populace concerning the requirement for smart city development, and to propose guidelines for the development of a smart city that satisfies the demands of people in areas with cultural and natural values.

Literature Review

The research objectives are divided into two parts.

Smart City

The definition of a smart city is a developed and populated area that utilises modern and intelligent technologies and innovations to enhance the efficiency of service provision and urban management and reduce costs and resource consumption, with a focus on good design and the active involvement of all stakeholders, especially the public, in the city's development. It is based on the concept of creating liveable and modern cities that provide residents with a good quality of life and sustainable happiness (Srichiangsa & Wongthanawat, 2020). Smart cities are categorised into seven aspects: (1) Smart Economy, (2) Smart Mobility, (3) Smart Energy, (4) Smart Living, (5) Smart Environment, (6) Smart People, and (7) Smart Governance (DEPA, 2021). The development approach for Amphawa Subdistrict Municipality should focus on urban management systems that utilise the benefits of technology to plan the development of both large and small urban areas. It should consider the multiple dimensions of the social, economic, cultural, and community collaboration factors, and it is essential to consider the context of the municipality, which has valuable resources that reflect its historical and cultural significance (Cvar et al., 2020; Lopes & Oliveira, 2017). The development approach must also align with policies

that promote the use of personal communication devices to enhance the quality of life and stimulate the economy to support eco-tourism. This aligns with the vision outlined in the local development plan for the years 2018–2022 of Amphawa Subdistrict Municipality (Amphawa Sub-district Municipality Office, 2019; Jensantikul, 2020). However, in order to administer urban management and improve the quality of life for the residents, the use of smart city concepts is crucial to enhance the efficiency of urban management. Local municipalities can establish measures and regulations to control and mitigate any negative external factors, for example, using urban planning as a tool to promote city development and issuing regulations to control accommodation usage. Special measures can also be implemented to protect and preserve historical and surrounding areas. These measures should be appropriately integrated with the use of technology to improve the efficiency of urban management (Calle-Vaquero et al., 2021; Lopes & Oliveira, 2017). An example is of the development of Amsterdam city, which desired to develop a city to preserve and promote cultural heritage, improve quality of life, giving people a sense of ownership towards history and culture (Angelidou et al., 2017). Sri-Trang City (Office of Trang Province [OTP], 2020) and Yala City Municipality, Thailand (Yala City Municipality [YCM], 2022), have cooperation in all sectors concerning using technology to improve the landscape, preserving the identity of the community, and promoting cultural and historical sites.

Cultural and Natural Environment Sites; the Content can be divided into Two Parts

1. The term "cultural environment sites" refers to the environments that hold value in terms of art, culture, history, archaeology, and technology, both past and present. These can be divided into two groups: individual cultural sites and groups of architectural cultural sites. In Amphawa Subdistrict Municipality, there are four temples as individual cultural sites, and the old community area as a group of architectural cultural sites (Office of Natural Resources and Environmental Policy and Planning [ONEP], 2023).

2. The term "natural resources and environments" refers to the things that occur naturally and can be utilized by humans around us, both living and non-living entities. (National Agricultural Big Data Center, 2023). Although changes in the area are being developed to support eco-tourism, a small municipality such as Amphawa Subdistrict Municipality has the potential to utilise technology in line with the concept of a smart city to enhance the efficiency of city management, provide the residents with a good quality of life and develop the area in a manner that is suitable for the valuable resources that are found there. This can be achieved through the active participation of the community and all sectors.

Methodology

This research used both quantitative and qualitative methods, namely, collecting public opinions on the development of a smart city and proposing development guidelines. The research process is as follows: (1) study of cultural and natural environmental sites: this involved examining data on the cultural environmental sites in Thailand provided by the ONEP (2023). In the study area, there are five cultural sites, namely: (1.1) Amphawa canal community, (1.2) Wat Nang Wang, (1.3) Wat Bang Kapom, (1.4) Wat Amphawan Chetiyaram, and (1.5) Wat Kasemsoranaram. And, the significant natural environment in the area is the Mae Klong River; (2) addreadiness situation regarding the components of a smart city: this involved categorising the aspects of a smart city into seven dimensions according to the Digital Economy Promotion Agency (2021). Data were collected through surveys, interviews, and classification into seven dimensions; (3) study of public opinions: this involved conducting a questionnaire survey and statistical analysis, including means and correlation tests, to examine public preferences for the development of a smart city that preserves culturally valuable and environmentally significant areas for the future. Factors related to the seven components of a smart city were taken into account; (4) study of the readiness for smart city development: this involved interviewing representatives from various organisations and summarising the results through qualitative analysis to gather opinions on issues, challenges in city development, problems and management of cultural and natural environmental sites, and opinions on urban development plans in line with smart city concepts; and (5) data analysis and the proposal for development towards a smart city: based on the review of the relevant literature and the aforementioned research steps, the findings were used to propose development guidelines for a smart city that align with the preferences of the local population in areas with valuable cultural and natural environments as shown in Figure 1.

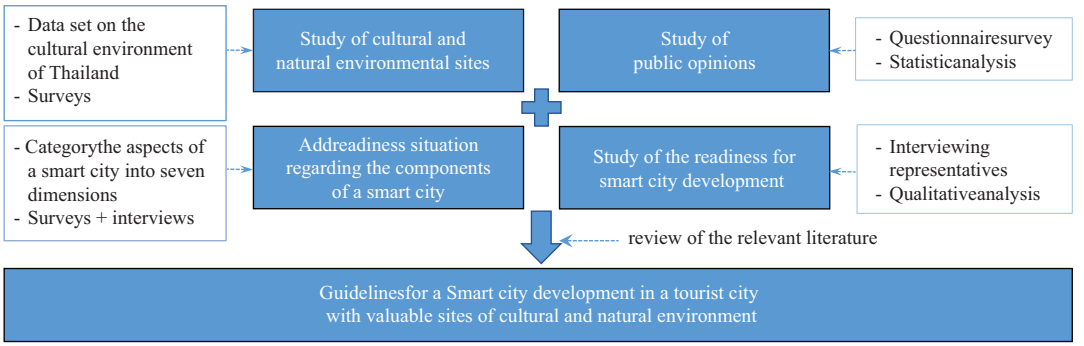

Figure 1 Research methodology

Participants

The questionnaire was employed to determine the sample group according to the population proportion using Yamane's formula, 95 percent confidence level, with a sample size of 370 people. The interviewees were divided into 3 groups: (1) Government representatives for city development from the Amphawa Sub-district Municipality Office; (2) representatives for the conservation of cultural and natural sites from the Central Office of Natural Resources and Environment; and (3) an urban planning expert, a representative from the Provincial Public Works and Town Planning Office and a professor teaching urban planning in a total of 5 people.

Data Collection

Physical information, data for smart city components, and information on the cultural and natural environment sites were collected and there was the use of surveys and interviews for research on development and opinions.

Data Analysis

The data analysis process included several steps: (1) Field surveys and the secondary data were conducted to gather information about the cultural and natural heritage sites in the area; (2) physical data analysis was performed to assess compatibility with the components of a smart city; (3) questionnaire data were distributed to gather public opinions, which were then subjected to statistical analysis. Measures such as mean were used to interpret the data and determine the level of needs in each aspect of urban development. Additionally, the chi-square test was employed to examine the significant relationships between the demographic characteristics and development preferences in each aspect, using a significance level of .05; and 4) qualitative analysis was conducted on the interview data and synthesised with the aim to identify the guidelines for the development of the area into a smart city.

Results

According to the dataset of cultural and natural environment sites in Thailand compiled by the ONEP (2023), in Amphawa Sub-district Municipality, there are 5 cultural environment sites and 1 natural resource in its history and importance as follows;

1. The cultural environment sites consist of the following: (1) Amphawa canal community: It is a community of traditional floating markets that has been in existence since the distant past. It includes a group of unique wooden buildings along the canals, preserving the cultural values and traditional way of life by serving as residential areas, commercial areas, and accommodations for tourists. Currently, the architectural designs are more circular and aligned with the way of life and culture of Amphawa, as defined by the dense land use regulations and controlled building heights in the Amphawa comprehensive plans. This approach aims to reduce the conflicts that previously arose from the construction of luxury riverside hotels in cultural conservation areas. The building designs that previously conflicted with the community's culture were not circular and did not align with the way of life of the Amphawa people due to the flaws in the expired old comprehensive plans and the lack of regulations controlling the construction of riverside buildings in terms of their form and height; (2) Wat Nang Wang: Built in 1940s, the temple was given land for the construction of the chapel in 1917. Originally named Wat Petch Noi Nang Wang

with some important sacred objects, such as Luang Por Daeng, there is a principal Buddha image, Phra Sariputra, Phra Mokkallana. The construction and environmental arrangement within the temple are not dense and do not contradict the original culture of the area; (3) Wat Bang Kapom: This ancient temple was built in the late Ayutthaya period in 1767. Its architecture resembles a Chinese pavilion, and inside, there is a large Buddha's footprint adorned with pearls. The wall panels are made of carved stucco depicting the Buddha's biography. Wat Bang Kaphom was registered as a national archaeological site by the Fine Arts Department in 1996. The temple has also constructed a new rear sanctuary near the riverside, with a large-sized image of Luang Pho Kong placed on it. The environmental arrangement and the establishment of non-dense commercial areas within the temple do not contradict the landscape of the riverside area. However, the problem when entering the temple is that tourists do not know where the valuable ancient sites are located because it does not show the history, origin, importance and location of valuable ancient sites; (4) Wat Amphawan Chetiyaram: Built in the reign of King Rama I, and the birthplace of King Rama 2, the temple was registered as a national archaeological site by the Fine Arts Department in the Royal Gazette in 1957. Within the temple's large area, although it is a popular tourist attraction with various activities, the architectural structures and landscaping remain consistent and promote the preservation of ancient values; and (5) Wat Kasemsoranaram: Formerly known as Wat Mai Ta Phet, it was named after the donor who provided the land for its construction in 1987. The old chapel was built to reflect the artistic style of the early Rattanakosin era. Inside the base of the Buddha image, there is a carved stucco panel depicting the victory of the Buddha, along with a historical account of the Lord Buddha. Currently, there is an ongoing renovation due to some damage caused by humidity inside the chapel. The renovation will preserve the original design and use the same materials, under the supervision of the Fine Arts Department.

2. Natural resource is the Mae Klong River with a waterfront settlement as the community utilizes this water resource for agriculture, residence, and trade. It portrays a unique way of life and has created a famous eco-tourism attraction.

Addreadiness situation regarding the components of a smart city in seven aspects are as follows.

Smart economy

Based on historical traits and historical artifacts and there is a waterfront community, it increases ecotourism through development in the following ways: (1) using social media to advertise goods, services, and local tourism; and (2) using the application to help support the concept of a low-carbon tourism city of Thailand Tourism Authority.

Smart mobility

(1) there are many ways for public transportation to support people's way of life and travel, including for visitors. At the Amphawa Floating Market, there are motorbike taxis, taxi cabs, and vans that run within other cities and Amphawa, the city of origin; (2) the network of bicycle routes within the tourist attraction to promote tourism (Figure 1 shows the bicycle routes (green) in the area); and (3) there is a boat to take tourists to see the way of life along the Amphawa Canal to encourage waterway tourism.

Smart energy

There has not been any support for alternative energy or renewable energy to mainstream electricity.

Smart living

(1) there are CCTVs installed in municipal areas; (2) there is a communication network system (WIFI) to provide services to citizens and tourists; (3) the use of social media via Facebook to express opinions or complaints; and (4) to do shopping via Mobile Banking.

Smart environment

(1) supporting walking and cycling in tourist attractions; (2) preserving agricultural areas and natural water sources; and (3) garbage-picking boating activities from the cooperation of the government, private sectors, and people to collect garbage in the Amphawa Canal.

Smart people

(1) the area is a traditional waterfront agricultural community with an old way of life and culture integrated with a new culture, which is reflected through tourism promotion activities to generate income such as home-stays; (2) participation of people to improve quality of life; and (3) social interaction and assistance among diverse age and gender groups in bringing technology to boost the economy and improve quality of life.

Smart governance

Providing services through online communication channels to improve the quality of life for citizens and tourists.

People's Demands: The results of the questionnaire and interview form.

1. Results from the questionnaire in terms of (1) population characteristics showed that most of them were male (59.2%), aged between 45–54 years (32.2%), Buddhist (99.7%), have bachelor's degree (38.9%), do personal business/trade (62.2%), and have resided in the area for more than 10 years (92.7%); (2) the demand for smart city development, divided into two areas: the developments that take into account the areas with cultural value and natural value, in which the values for the 9 aspects of the need levels are presented with the mean Chi-Square Test at the statistical significance level of .05 ($p < .05$) (Table 1).

2. The interview results from the sample group were categorized into three groups: (1) the Amphawa Sub-district Municipality Office representatives who were asked in terms of readiness for smart city development; (2) the Office of Natural Resources and Environment representatives who were asked in terms of natural resources and cultural-related problems and questions; and (3) experts in urban planning issues with urban planning (Table 2).

Table 1 The demands for future smart city development

The needs for future smart city development	Average	Demand value	$p < .05$	Percentage of correlated variables
The development needs by taking into account preservation of areas of cultural value				
1. The improvement of the government's information access system	4.78	Highest	.000	Trading occupation (57.8%)
2. The development of transportation systems in the valuable area to be modern, convenient, safe	4.36	Highest	.013	Stay more than 10 years (88.3%)
3. The knowledge provision for people on innovation and technology	4.26	Moderate	.006	Stay more than 10 years (87.5%)
4. The development of urban amenities and valuable areas	4.24	Moderate	.000	Trading occupation (46.6%)
5. The application of digital technology for preservation of ancient sites and antiques	4.18	Low	.000	Stay more than 10 years (85.6%)
6. The application of digital technology to manage cities and conserve valuable areas	4.13	Low	.000	Stay more than 10 years (84.6%)
7. Land utilization planning by taking into account the conservation of valuable areas	4.12	Low	.000	Stay more than 10 years (85.5%)
8. The application of innovation to change business related to culture	4.12	Low	.000	Stay more than 10 years (84.7%)
9. Encouraging people to participate in urban development	4.11	Low	.000	Stay more than 10 years (85.2%)
The development needs by taking into account preservation of areas of natural value				
1. The improvement of the government's information access system	4.86	Highest	.001	Age: 45–54 years old (28.7%)
2. The utilization of digital technology in disaster surveillance	4.82	Highest	.012	Bachelor's degree (42.8%)
3. The development of facilities in cities and areas of natural value	4.4	Moderate	.000	Trading occupation (53.5%)
4. The development of modern transportation systems in areas of natural value. convenient and safe	4.28	Moderate	.000	Stay more than 10 years (86.6%)
5. Encouraging people to participate in urban development and conservation	4.24	Moderate	.000	Stay more than 10 years (85.0%)
6. Promoting the use of alternative energy, renewable energy in cities and valuable areas.	4.21	Moderate	.001	Stay more than 10 years (86.6%)
7. The application of digital technology to measure and monitor environmental quality	4.2	Moderate	.000	Stay more than 10 years (85.5%)
8. Land utilization planning by taking into account the conservation of valuable areas	4.17	Low	.000	Stay more than 10 years (84.9%)
9. Encouraging the use of energy-saving and environmentally friendly vehicles	4.17	Low	.002	Stay more than 10 years (86.7%)

Table 2 Opinions on smart city development in areas with cultural and natural values

Agency	Opinions on smart city development
Amphawa sub-district municipality	Regarding the readiness for smart city development
1. People's understanding of "Smart City"	• More than 50% of people are elderly who do not have any knowledge and understanding of smart city development.
2. Problems and obstacles in the smart city development	• Policies and plans have not yet emerged due to the needs of the people. • Infrastructure is not comprehensive, especially connecting the transportation system • Participation in each sector is minimal. The government sector lacks experts and citizens still lack knowledge. • Lack of support budget • Local people moved out and the traders are newcomers.
3. Guidelines for management and care	• There should be the promotion of smart city development and creation of knowledge and understanding to attract tourism. • Strengthen the democratic process by giving people access to news and allowing them to participate.
The Office of Natural Resources and Environment	Regarding the cultural and natural environment sites
1. Current situation and problems	• In terms of social management and administration, economic development and tourism affect the environment. • Participation in the management of citizens is viewed as the duty of the government. • Some cultural environment sites deteriorate due to the lack of staff care. • New developments are not consistent with the original conditions and cause unusable resource recovery.
2. Guidelines for management and care	• There should campaign and publicize public awareness of the value. • Promote OTOP Inno-life Tourism Based community. • All relevant sectors should jointly enact explicit laws in the process of the conservation of resources to provide the local authority the power to enforce the regulations seriously.
Samut Songkhram office of Public Works and Town & Country planning: Urban planning instructor	Regarding urban planning and development
1. Essential factors for smart city development	• Public participation in consultation to determine the direction of development. • In public relations to educate people, agencies must understand their urban context. • Prioritize development to be appropriate and consistent with urban areas.
2. Urban planning considerations	• Implement appropriate urban planning measures to support urban development, such as Transfer of Development Rights: TDR. • There should not be any development beyond the carrying capacity as the city will be overcrowded. • New developments and the conservation of original resources should coexist.

Discussion

From analysing the development needs of the city and readiness for smart city transformation based on the synthesised data, the following findings were observed:

There is a need to improve the Accessibility of Government Data. This is particularly important for the Population aged 25–34 who are engaged in Business and Trade

Guidelines for smart city development, specifically in Smart Living and Smart Governance, indicate the presence of online social media usage. The data from the questionnaires and population analysis consistently show the highest demand for development in these areas. Although the majority of the population in the area consists of elderly individuals (according to data from interviews), there are still some young adults (aged 25 to 34) who are part of both the original and new inhabitants. They also express a need for increased government services in terms of convenience.

There is a Demand to develop Modern, Convenient and Safe Transport Systems, as expressed by Residents who have lived for over 10 years, Indicating the Highest Demand

Guidelines for developing a smart city in the areas of Smart Mobility and Smart Environment: According to the

readiness situation data, there are a variety of public transport options available, including motorcycle taxis, taxis, and vans, as well as bicycle routes. However, there is still a lack of convenient and comprehensive connectivity to other systems, especially for waterfront houses, based on information gathered from the interviews. To enhance accessibility, it is recommended that the creation of pedestrian networks and bicycle routes within the community be promoted. These routes should connect the tourist attractions that have cultural value in the area. An analysis of walkable and bicycle-friendly distances should cover important natural attractions along the waterfront, such as the Amphawa Floating Market and the Amphawan Chetiyaram Temple, within a distance of no more than 300 meters. This distance falls within the acceptable walking distance range of approximately 220 meters, which takes about 2.8 minutes (Harris & Dines, 1998). And, all destinations should be connected within a distance of no more than 500 meters. (Figure 2 show the locations of cultural environment sites and natural resources, connectivity of bicycle routes and access distances to major tourist attractions and cultural environment sites).

In the Aspect of Knowledge Creation Regarding Innovation and Providing Technology to the Community, especially for Disaster Surveillance, such is based on the Strong Relations among Residents who have been living There for over 10 Years and the High Demand for Undergraduate Studies

Guidelines for developing a smart city in the areas of Smart People, Smart Environment, and Smart Economy emphasise utilising technology to enhance the quality of life and learning, whilst increasing income through adaptation to current changes. Additionally, the original population, which is an agricultural community along the river, still faces the risk of flooding and therefore requires conservation of their riverfront way of life. Effective technology is needed for disaster prevention and warning systems to create stability in daily life and promote eco-tourism activities (Angelidou et al., 2017). In addition, the use of smart people technology should be promoted to help publicize valuable culture resources. For example, providing information on the interesting points of each destination and highlighting the value of each location on an easy-to-use map. This is important because many

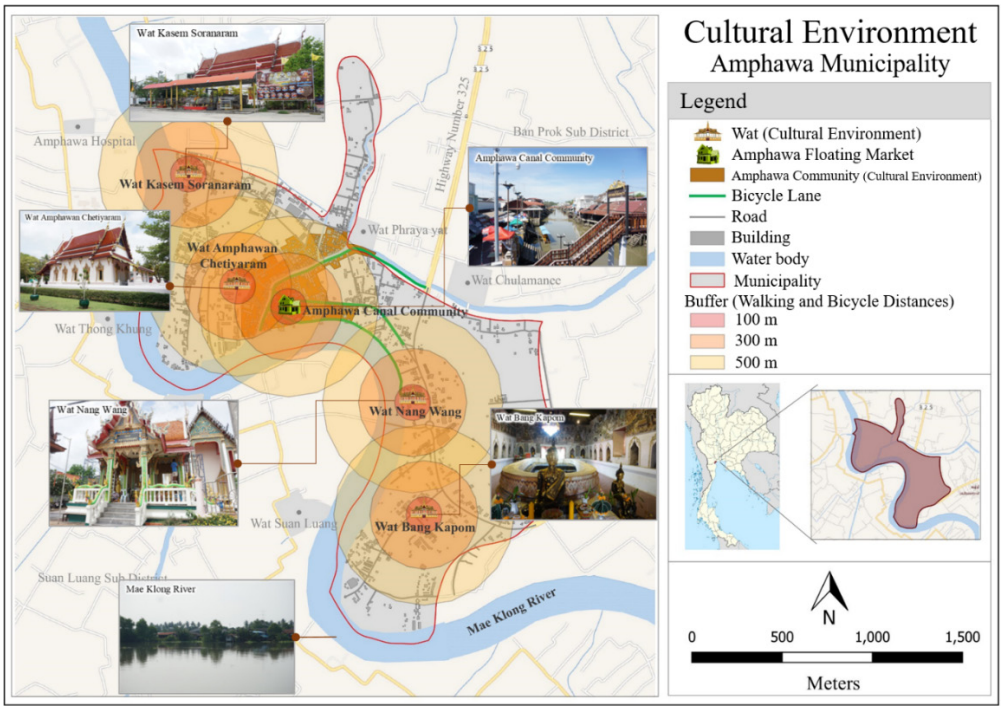

Figure 2 The locations of cultural and natural resources, bicycle routes and access distances
Source: Google map image modified by the authors (2022).

tourists visit these places without fully understanding their significance, which results in the neglect and underappreciation of these cultural heritage sites (Lopes & Oliveira, 2017). An example is of smart temple sign to provide information to tourists when entering the temple, such as the locations of important cultural sites, history and the data which demonstrate the importance of cultural sites. (Figure 3: smart temple sign, showing important information about the valuable cultural sites by creating a simple QR Code in Thai language that people in the community can cooperate with in providing).

Enhancing the Infrastructure and Amenities in the City and Valuable Areas, such as Ramps and Street Lighting: Based on the Strong Relationship with Residents engaged in Private Businesses and Trading. There is a High Demand for These Facilities

Guidelines for developing a smart city in the area of Smart Living ensure the well-being and quality of life for the population, with a focus on safety at all ages, particularly for the elderly population, which is abundant within the municipality. They require convenient amenities that support their daily activities and enable them to live comfortably. Increasing street lighting and providing convenient facilities will contribute to safety and enhance the residential experience for both the local community and the tourists visiting the tourist attractions.

Conclusion and Recommendation

The Amphawa Subdistrict Municipality boasts valuable cultural and natural environment sites, including temples and historic community areas that reflect its historical significance, culture, and traditional way of life along the Mae Klong River, a natural environmental site. Based on the synthesised data regarding people's demands towards becoming a smart city, the promotion, preservation, and conservation of cultural heritage and natural sites can be addressed through the following 6 elements:

Smart Living

Enhancing access to government information and improving the development of amenities in the city and valuable cultural and natural areas. Specifically, in a city where more than half of the population consists of elderly individuals, the design of amenities should be accessible and suitable for people of all ages and genders. This includes ensuring convenient access for both residents and tourists, as well as addressing the challenges faced in areas with unstable residential structures, such as parts of the canal-side community in Amphawa. These measures are fundamental in enhancing the quality of life in line with the principles of a smart city. Examples include increasing street lighting for improved safety and convenience for commercial activities, implementing automated street lighting systems, and collaborating

Figure 3 Example of smart temple sign
Source: Google Street view image modified by the authors (2022)

on security maintenance and emergency reporting, especially in tourist destinations and densely populated traditional communities that face the risks that are associated with the original wooden buildings, such as the riverside area of Amphawa. Measures such as installing CCTV cameras and smart sensors for emergency alerts related to disasters or criminal activities are essential to facilitate the use of technology, particularly for elderly residents who may have difficulty accessing notification apps through social media platforms (Lopes & Oliveira, 2017).

Smart Governance

Promoting the use of online social media platforms for expressing opinions, complaints. Furthermore, it involves utilising technology to enhance opportunities for promoting democracy (Visvizi & Lytras, 2019). In the public sector, technology can be used to increase efficiency and manage urban resources by utilising online media for campaigning, allowing the public to access documents and information to verify and evaluate the transparency of municipal operations, thereby promoting public participation.

Smart Mobility

Analysing pedestrian distances and bicycle network infrastructure to strengthen the bicycle network, which will promote tourism and improve the quality of life. Additionally, improving accessibility within the community, particularly in areas with limited access and communities surrounding cultural sites, helps maintain and preserving their condition, which will prevent deterioration.

Smart Environment

Promoting walking and cycling to preserve the environment and promote health. Additionally, there is a need to educate the public about innovative technology and its use in monitoring disaster risks, particularly in agricultural communities at risk from flooding. This contributes to creating a sense of security in daily living and promoting eco-tourism activities. In terms of protection, the physical impact of new developments in these conservation areas should be considered so as to ensure that new construction does not compromise the value of the original cultural heritage. Construction activities that generate significant vibrations should be avoided in order to prevent damage to older cultural sites.

Smart People

Providing knowledge about innovation and technology to the public to enhance the quality of life. Assistance should be provided to diverse age groups so that they are able to increase their income and develop a quality of life that aligns with the identity of the older culture. In terms of promoting public participation to support tourism and cultural preservation, people in the area can use technology to promote the provision of cultural information at each location (example as shown in Figure 3) (OTP, 2020; YCM, 2022).

Smart Economy

Utilising innovation and technology to increase income from tourism, especially those with historical and cultural value. This can be used to promote marketing and provide information that highlights the significance of each area.

However, in the development towards becoming a smart city, it is crucial to preserve the historical, cultural, and traditional aspects that reflect the original way of life and serve as important identities. Therefore, it is necessary to consider the limitations and challenges. The proposed development guidelines are as follows; (1) The municipality can collaborate with community groups and organisations to establish a network that utilises technology in city management with the aim to enhance the quality of life and provide information to promote tourism, especially by offering valuable insights about local attractions. It is essential to promote knowledge and awareness among the public and organisations regarding the value of local resources and the significance of their own city. This understanding should encompass the potential and limitations of appropriate development as it directly impacts the preservation of resource value. For instance, improperly planned landscape arrangements may result in the loss of value. (Office of Natural Resources and Environmental Policy and Planning, 2016). Moreover, development should incorporate policies and coordination at the provincial level in order to foster equitable development opportunities at the local level; (2) The physical transformation resulting from tourism development may erode the original values of the community as it transitions from a riverside way of life to a land-based one. This transition may lead to the displacement of the original residents and a loss of significance in their way of life. Therefore, when undertaking new construction, it is vital to consider the environmental

context, local identity, and surrounding culture, thereby ensuring harmony and alignment with the original area. Promoting and controlling this development necessitates community involvement, as they can contribute to the care and observation of their own area when they recognise the role and value of their cultural and natural resources within their living environment; (3) To encourage participation in the smart city concept and ensure that new developments align with local culture whilst preserving the original values of the area, the municipality can seek opinions and suggestions as well as engage in activities with various stakeholders. Collaboration can extend to the design of buildings and structures, as well as defining the activities in the vicinity of the cultural and natural sites where they reside such as participate in building a smart temple sign; and (4) Urban planning measures should be considered to promote area development, including tax measures to encourage collaboration with the municipality, particularly in cases involving the private sector so as to promote the use of technology for quality of life development and the preservation of cultural and natural sites in the aforementioned direction and overlay of zoning to control overlapping areas in order to determine the conditions for existing land use, ensuring coverage of registered historical sites by the Department of Fine Arts, and designate buffer areas to help prevent encroachment and development that diminishes the value of the resources (Department of City Planning, 2014).

From this research article, it is evident that the findings will be beneficial for organisations involved in urban development, whether in large or small cities, especially those situated in areas with valuable cultural and natural resources. This study aims to provide valuable insights into the initial stages of development, utilisation of smart city principles and consideration of the limitations, precautions, policies, and relevant laws within the urban context. Moreover, it is crucial to actively involve all stakeholders in the creation of systems and plans, as well as the establishment of a strong foundation for future development.

Conflict of Interest

Authors declare that there is no conflict of interest.

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References

Amphawa Sub-district Municipality Office. (2019). *Local development plan (2018–2022 Five-Year Plan)*. http://amphawa.go.th/page/file/view/file/298 [in Thai]

Angelidou, M., Karachaliou, E., Angelidou, T., & Stylianidis, E. (2017, August 28-September 1). *Cultural heritage in smart heritage in smart city environments* [Paper presentation]. 26th International CIPA Symposium, Ottawa, Canada. https://doi.org/10.5194/isprs-archives-XLII-2-W5-27-2017

Boonthien, K. (2018). *Ecotourism management in Amphawa District, Samut Songkhram Province* [Unpublished master's thesis]. Mahachulalongkornrajavidyalaya University. [in Thai]

Cvar, N., Trilar, J., Kos, A., Volk, M. & Stojmenova Duh, E. (2020). The use of IoT technology in smart cities and smart villages: Similarities, differences, and future prospects. *Sensors*, *20*(14), 3897. https://doi.org/10.3390/s20143897

Calle-Vaquero, M. d. l., García-Hernández, M. & Mendoza de Miguel, S. (2021). Urban planning regulations for tourism in the context of overtourism. Applications in historic centres. *Sustainability*, *13*(1), 70. https://www.mdpi.com/2071-1050/13/1/70

Department of City Planning. (2014). *The expenses from hiring consultants for developing city planning development measures, mechanisms and instruments under the comprehensive plans of Bangkok*. Department of City Planning.

Digital Economy Promotion Agency. (2021). *Smart city development*. https://www.depa.or.th/th/smart-city-plan/smart-city-office [in Thai]

Harris, C. W., & Dines, N. T. (1998). *Time-saver standards for landscape architecture* (2nd ed.). McGraw-Hill. https://archive.org/details/TimeSaverStandardsForLandscapeArchitecture/page/n247/mode/2up?view=theater

Jensantikul, N. (2020). Smart city: Meaning and considerations for city development. *Integrated Social Science Journal*, *7*(1), 3–20. https://so02.tci-thaijo.org/index.php/isshmu/article/view/243834/165426

Karvonen, A., Cook, M., & Haarstad, H. (2020). Urban planning and the smart city: Projects, practices and politics. *Urban Planning*, *5*(1), 65–68. https://doi.org/10.17645/up.v5i1.2936

Lopes, I.M., & Oliveira, P. (2017). Can a small city be considered a smart city. *Procedia Computer Science*, *121*, 617–624. https://doi.org/10.1016/j.procs.2017.11.081

National Agricultural Big Data Center. (2023). *Data group: Natural resources and environment*. https://nabc-catalog.oae.go.th/group/about/environmental-information [in Thai]

Office of Natural Resources and Environmental Policy and Planning. (2016). *Guideline for cultural environmental management-to reduce landscape impacts*. Ruenkaew Printing.

Office of Natural Resources and Environmental Policy and Planning. (2023). *Cultural environment site*. https://www.onep.go.th/cultural-environment/ [in Thai]

Office of Trang Province. (2020). *Sri-trang city plan*. https://ww2.trang.go.th/files/com_news_ict/2022-07_dd92133ec19034e.pdf [in Thai]

Pozoukidou, G., & Angelidou, M. (2022). Urban planning in the 15-minute city: Revisited under sustainable and smart city developments until 2030. *Smart Cities*, *5*(4), 1356–1375. https://doi.org/10.3390/smartcities5040069

Srichiangsa, T., & Wongthanavasu, S. (2020). Public perception of the Khon Kaen smart city initiative. *Local Administration Journal*, *13*(2), 153–170. https://so04.tci-thaijo.org/index.php/colakkujournals/article/view/240052 [in Thai]

Visvizi, A., & Lytras, M. D. (2019). *Smart cities: Issues and challenges. Mapping political, social and economic risks and threats*. Elsevier. https://www.academia.edu/40099343/Smart_Cities_Issues_and_Challenges?email_work_card=view-paper

Yala City Municipality. (2022). Yala smart city. *Public Relations Journal of Yala City Municipality*, *22*, 238. https://yalacity.go.th/files/com_ebook/2022-04_72e0cba4fcc9e44.pdf [in Thai]