Article

A Study of the Environmental, Economic, and Social/Cultural Impacts of Historical and Cultural Tourism in the Old Town District of Chiang Mai: Evaluating the Sustainable Development Possibilities for a Destination under Consideration as a World Heritage Site

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ABSTRACT

Chiang Mai is one of the most famous tourist destinations in Thailand. It is currently included on a UNESCO list of tentative World Heritage sites. If approved, this designation may lead to benefits such as additional tourists visiting Chiang Mai but may also cause more problems. This research investigates potential economic, sociocultural and environmental impacts that this designation may have on the Chiang Mai Old Town district. The study area is composed of six temples with high value as tourism destinations. The impacts are analyzed using both quantitative and qualitative methods to identify positive and negative results. The social and cultural impacts were mixed. Although becoming a World Heritage site would offer increased opportunities to educate foreigners about Thai culture, it might denigrate local culture by treating it as just a commodity for foreigners. The economic impact results show that income would be higher, but so would the cost of living in the area. Although there would be positive environmental impacts such as better management of the historic site ecosystem, the amount of non-biodegradable waste in the area would increase. Furthermore, analysis of life cycle assessment (LCA) data on this tourism area indicates that environmental impact levels would depend on the number of visitors. In order to provide sustainable tourism in the study area, we also propose policy making guidelines.

KEYWORDS: sustainable tourism development; world heritage; social and cultural impacts; economic impact; environmental impact; life cycle assessment

G Open Access ■

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ABBREVIATIONS

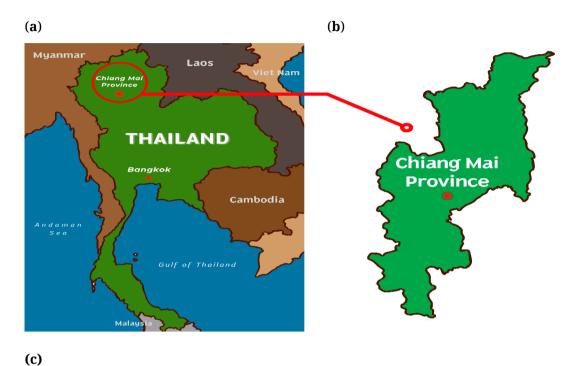
UNESCO, United Nations Educational, Scientific and Cultural Organization; LCA, life cycle assessment

INTRODUCTION

Tourism is Thailand's main source of income and contributes to the country's economic development. Cultural tourism focuses on national treasures and does not harm the environment or ecosystem. In accordance with Thailand's national policy, cultural tourism can encourage local learning and economic distribution. The United Nations established Sustainable Development Goals (SDGs) and issued 36 recommendations for sustainability policy. Thailand signed an agreement to work with the rest of the globe to achieve this goal. As part of a long-term national development plan that focuses on the expansion of different economic sectors, the government developed a policy that emphasizes preservation of tourism resources in order to ensure their future viability. Thailand plans to achieve carbon balance (carbon neutrality) in 2030 as part of sustainability and self-sufficiency efforts. This issue falls within the development principle of the Bio-Circular-Green Economy (BCG model), a paradigm of economic development. By stressing the use of bio-resources (Bio-economy) which exist in a variety of forms in Thailand, the method can focus on the development of numerous sectors, particularly tourism. A "Green Economy" stresses the conservation of existing resources through efficient and repeated use (Circular Economy) to limit both the amount of resources that must be imported from other nations and the amount of environmental damage done. These efforts include circulating and reusing all existing resources for the greatest benefit (Circular Economy). They preserve other resources that must be acquired from outside and have the least environmental impact (Green Economy). The map location of Thailand country, Chiang Mai province and the old town and subdistrict area in Chiang Mai can be demonstrated in Figure 1.

Thailand currently has eight UNESCO World Heritage Sites, which can be divided into two categories: cultural heritage and natural heritage. World Cultural Heritage Sites include: the Historic City of Ayutthaya (1991), the Historic Town of Sukhothai and Associated Historic Towns (1991), the Ban Chiang Archaeological Site (1992), the Ancient Town of Si Thep and its associated Dvaravati monuments (2023), and Phu Phrabat, a testimony to the Sima stone tradition of the Dvaravati period (2024). The three World Natural Heritage Sites are the Thungyai-Huai Kha Khaeng Wildlife Sanctuaries (1991), the Dong Phayayen-Khao Yai Forest Complex (2005), and the Kaeng Krachan Forest Complex (2021) [1]. When applying to be listed as a World Heritage Site, applicants must compile a list of places with both natural and cultural significance. These accounts are known as Preliminary or Tentative lists, and these sites are eligible to be nominated as World Heritage Sites. Following that, sites may be nominated for the

creation of a data file (nomination file), which is be examined and considered by relevant organizations, including: the International Council on Monuments and Sites (ICOMOS), the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), and the International Union for Conservation of Nature (IUCN). In later steps, these organizations offer their proposals to the World Heritage Committee [2].



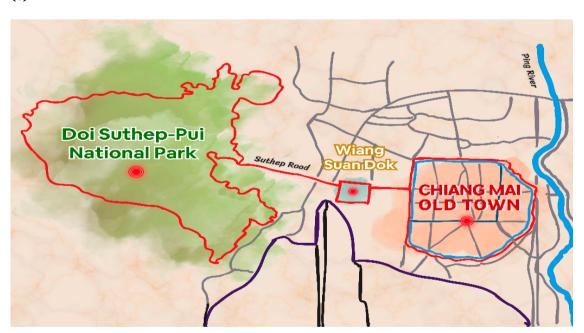


Figure 1. (a) Map showing the location of Chiang Mai province in northern Thailand (author); (b) Map of Chiang Mai province (author); (c) Map of the old town and subdistrict area in Chiang Mai showing the area proposed for inscription as a World Heritage Site due to its historical and architectural significance (the red line zone) (author).

Chiang Mai is a prominent tourist site within the cultural legacy of the Lanna, with a history of almost 700 years. It was once the heart of the Lanna Kingdom. It is a city rich in both tangible and intangible cultural assets, such as temples, ancient sites, and architecturally notable buildings, as well as legends, beliefs, and other ways of life.

Chiang Mai is currently undergoing UNESCO certification, and is currently presented in a tentative list. Following its designation as a World Heritage Site, Chiang Mai will be advertised to tourists from all around the world, and a resulting increase in visitors is anticipated [3]. The tourism business has grown to serve the needs of more visitors, as has the construction of community facilities in the World Heritage region. This will have both positive and negative consequences. Social and cultural factors in local people's ways of life may change. People in local neighborhoods could benefit economically from increased spending in Chiang Mai, but it could also increase economic and social inequality while promoting development. Promoting visits to ancient sites is important for attracting tourists, but the utilization of resources has the potential to devastate the environmental systems communities near them. It is vital to examine the implications of a sustainable development strategy when developing tourist sites in the Chiang Mai World Heritage Area. There are sixty monuments within the area proposed as a World Heritage site. These monuments have significant historical value, and can be divided, based on location, into Chiang Mai Heritage Areas (Property), and buffer zones. The project nominating Chiang Mai province for designation as a World Heritage City divides the area into four different types of sites: (1) historical and artistic heritage; (2) religious and archaeological reflecting the Lanna identity; (3) heritage representing prominence in urban planning; and (4) heritage in buffer areas that connect to Chiang Mai's history [4].

Rather than conduct a broader project, the researcher decided to focus on areas important in history and art, architecture, and cultural heritage sites in the Old City. These include six important temples in the proposed Chiang Mai Province World Heritage site: Wat Phra That Doi Suthep; Wat Phra Singh; Wat Chedi Luang; Wat Prasat; Wat Chiang Man; and Wat Suan Dok. These were chosen to represent a sustainable development pilot project for tourism, researching the economic, ecological, and social impacts of tourist attractions. The appearance of these temples can be shown in Figure 2.



Figure 2. (a) Wat Suan Dok (author); (b) Wat Phra Singh Woramahaviharn (author); (c) Wat Phra That Doi Suthep Ratchaworawihan (author); (d) Wat Chedi Luang Worawihan (author); (e) Wat Chiang Man (author); (f) Wat Prasat (author).

Currently, Chiang Mai is participating in the UNESCO approval process. This is the next step after Chiang Mai was granted status as a World Heritage Site [3]. Chiang Mai will be advertised to tourists from around the world to familiarize them with the city, resulting in an increase in the number of international visitors. The tourism business has evolved in order to meet the growing number of visitors, including construction of community facilities around the World Heritage area. This will have repercussions, both positive and negative, for those involved. There is a possibility that current residents will see changes in the social and cultural aspects of their lives. The use of resources may devastate the ecology of communities located close to historic sites with residents who depend on tourism for their livelihood. Developers of tourist attractions in the World Heritage Area of Chiang Mai may need to consider the impacts of their actions when creating a strategy for sustainable development.

CULTURAL TOURISM

Cultural heritage is inherited from the past, and according to [5], it can be divided into tangible types, such as temples, archaeological sites, and buildings, and intangible ones like beliefs, customs, and ways of life. Cultural tourism serves to connect tourists with these aspects, facilitating a deeper understanding [6]. stated that cultural tourism explicates culture through lifestyles, ancient sites, temples, traditions, and beliefs, offering tourists insights into the history and origins of these elements.

Wigboldus [7] examined six World Heritage sites to compare positive and negative impacts, aiming to balance and sustain these tourist locations while maximizing their benefits for the surrounding communities. Furthermore, Islam [8] studied the cultural values, status of cultural heritage, tourism activities, and the need for proper management at the Kampong Ayer site in Brunei, a water village under consideration for World Heritage status.

In summary, cultural tourism focuses on sustainability and engaging stakeholders, particularly local communities who are the custodians of the cultural sites, to preserve and continue art and cultural traditions.

SUSTAINABLE TOURISM DEVELOPMENT

Definition of Sustainable Tourism Development

Sustainable tourism was a strategy conceptualized at the 1992 Earth Summit in Rio de Janeiro, Brazil when several countries signed a 21st Century Global Master Plan. Policies and guidelines for long-term development were defined [9]. Sustainable development focuses on meeting the requirements of both tourists and locals. with effective utilization and conservation of resources passed down through generations. As described below, sustainable development has three forms: environmental, economic, and social/ cultural [10] as described below:

- a) Environmental viability: a manner of living with natural resources that considers the utilization of resources such as soil, water, air, and fuel energy to be worthwhile;
- b) Economic stability: defines the effective and responsible use of resources in order to be profitable and sustainable and includes optimization of long-term resource use; and,
- c) Long-term social and cultural viability: includes a good sense of people's well-being, inherited and maintained for a long period.

This study investigates the concept of sustainable tourism in the Old Town area which is being considered for World Heritage status. For a development to become a successful tourist destination, there will inevitably be certain modifications and it is important that certain aspects be retained. When a tourist location is put forth for consideration as a World Heritage Site, it has the potential to become internationally known and recognized. There should be a tourism development plan that is characterized by sustainability in all three elements: economic, environmental and sociocultural.

Some previous research has explored issues regarding sustainable tourism development in old city areas.

Tantiseranee [11] studied the development of cultural tourism in an old town in Songkhla municipality. They found that this area had the potential to be a tourist attraction due to its exquisite old city architecture, cultural significance and community life. They developed six scenarios addressing the distinctive community tradition management potential of urban areas in Songkhla Municipality. These guidelines included:

- 1) preserving and developing cultural tourist attractions in the old town area;
- 2) developing the potential of cultural tourism sites;
- 3) promoting cultural tourism;
- 4) building a creative tourism management system;
- 5) developing knowledge management policies and procedures; and,
- 6) encouraging community participation development.

Hosseini [12] conducted research focused on World Heritage Sites in developing countries, analyzing the impact of tourist sites on the tourism sectors of 21 developing nations from 2000 to 2016. This research model can assist the tourism industry, including macro and micro systems, in creating more efficient tourism resource management. The findings indicate that cultural attractions in World Heritage sites with a positive image provide an important tool for tourism promotion. The research focused on socio-ecological issues associated with cultural attractions that provoke public criticism on the basis of both conservation and development. Because 94% of tourist destinations in developing countries generally lack tourism resources, the analysis focused on economic development periods and making a genuine contribution to challenges unrelated to conservation. This study indicates that the conservation of tourist attractions is a complicated social problem. It suggests an approach for the management of tourist attractions in developing countries designed to achieve and contribute to conservation, including sustainability of World Heritage Sites in accordance with the UN Sustainable Development Goals (SDGs).

In this current research, the study of tourism sustainability was carried out by studying the three elements of impact assessment: the environmental, economic, social, and cultural impacts on historical and cultural tourism destinations in the Old Town district to determine how to encourage sustainable development of a world heritage site in Chiang Mai, including temples of significant historical value. An assessment of each tourism's impact was conducted using the following tools.

Evaluation of Tourism's Social and Cultural Impacts

Tourism's social and cultural effect assessment employs a process known as Social Impact Assessment (SIA), a vital instrument for assessing the influence of social change on society. It employs quantitative and qualitative methodologies to assess the influence of plans, policies, or projects on society and to apply the findings to long-term sustainability. The following are important steps in social impact evaluation [13]:

- 1) Put a plan and management in place and involve all parties;
- 2) Create a backup plan to mitigate difficulties and repercussions;
- 3) Establish fundamental conditions for assessing impact;
- 4) Choose themes to examine and determine social measurements;
- 5) Plan for social consequences in order to mitigate them;
- 6) Anticipate the reaction to decrease the impact of change;
- 7) Consider indirect and cumulative effects as long-term remedies;
- 8) Provide new options based on requirements and opportunities; and,
- 9) Create a long-term management strategy for impact mitigation.

Previous research conducted on this issue includes Srakawee [14], who investigated the Social Impact Assessment (SIA) of community-based tourism development projects. This study used qualitative research for sustainable tourism with stakeholders in the context of communities in special regions (Public Organization). The findings revealed that projects' social impacts arose in four aspects of society:

- 1) Community members gained skills required for tourism business management;
- 2) Community relationships improved;
- 3) Community growth occurred in both business sectors: administration of additional regions and infrastructure systems; and,
- 4) Local history, customs and traditions were passed down to the next generation, resulting in cultural sustainability and a unique element of community tourism.

Ariza-Montes [15] studied the return on tourism investment from a project to preserve the cultural assets and traditions of southern Spain, a UNESCO tourist destination. They noted that a palace in the south of Spain was designated a World Heritage Site. This had a social impact as the social and cultural components attracted tourists to the rich heritage sites and cultural traditions. The outcomes enabled local people to collaborate in the protection of cultural assets and establish a conservation policy geared toward sustainable tourism.

Adulwiroj [16] conducted research on the impact of tourism in the Koh Samui District, Surat Thani Province in Thailand. This project evaluated the opinions of local people of Koh Samui District as well as the impact of tourism, including infrastructure, economics, social, environmental, and cultural issues. Findings showed that the inhabitants of Samui District have varying perspectives on the impact of tourism in their area. Tourism resulted in the construction of entertainment venues which had the potential to generate issues related to the sex industry and there were social issues caused by crime and theft. It is interesting that fewer people believed that tourism fosters a love of the hometown and local community cooperation.

The potential for social and cultural issues to impact and change opinions and attitudes will be examined in this study. The social effect difficulties generated by population tourism have impacted lifestyle patterns and living ideals. The effects that institutional or social/cultural community management have on the demands of infrastructure and expectations cause attitude changes toward tourism.

Assessment of the Impact of Tourism on the Economy

In order to analyze economic consequences, it is necessary to understand how economic growth and income distribution affect people in the community who live near tourist attractions. This analysis included evaluations of revenue and employment rates, as well as tourism-related expenses. There are numerous potential approaches to this economic assessment, such as the ones below.

Torre [17] compared the economic impact of tourism on cultural sites in Australia by examining the income generated. Using two separate methodologies, a spending multiplier method and a cost benefit analysis (CBA), revenue and expenditure numbers were both used to examine the economic impact. An equation to calculate the quantity of the relevant predicted revenue was also developed. A comprehensive assessment was performed using restricted data and settings, in addition to enumerating the limits of employing this equation to expand the potential for CBA assessments.

To meet the criteria for the United Nations' Sustainable Development Goals (SDG) set out in paragraphs 8 and 10, with a focus on meso-level education, Kronenberg [18] investigated the socioeconomic sustainability of workers at tourist sites. A professional database system and import-export operating principles were used for large tourist sites, which relevant to macro-scale through a professional database and the input-output model approach. According to the report, there is still a lot of inequality among employees in this field and workers in this profession often lack the required abilities. This issue should be investigated further as paragraphs 8 and 10 of the Sustainable Development Goals must be met.

Gonzalles-Mantilla [19] investigated the economic impact of shark diving locations in the Azores, Portugal. It analyzed the commercial worth of the shark diving sector by surveying tourists and residents on the island, as well as exploring possibilities for funding protection of this tourist attraction. They found that the attraction's tourism value surpassed \$1 million in 2019, with \$103,000 spent on shark conservation management and enforcement. It also advocated the employment of tax measures to improve local income and dedicate some revenue to future expenses for conservation.

Environmental Tourism Impact Assessment by Using the Life Cycle Assessment (LCA) as Tool

The environmental management system standard ISO 14040 specifies life cycle assessment (LCA) as an important standard method for use in environmental impact assessments [20]. LCA's central tenet is to assess the environmental effect of any product or service. It begins by assessing resources created as raw materials for use in the manufacturing process (Cradle), the manufacturing process and technology used to generate products (Gate), as well as classification, distribution and transportation to customers. It also evaluates the product use (distribution and transportation) and residue disposal (Grave). A product life cycle is evaluated in four steps: aim and scope definition, inventory analysis, impact assessment, and product interpretation and improvement (interpretation).

Setting goals and limitations is a critical step in product life cycle assessment and impacts the interpretation and evaluation outcomes. Study objectives are set in this step, including deciding on the scope of the study and the type of product to be evaluated. The identification of educational units or functional units that must be assigned to each situation (scenario) in the evaluation should have the same units of study so that the impact can be appropriately assessed in each case [21]. At this stage, limitations of the study are also identified.

For the purpose of analysis, that list can also be referred to as a Life Cycle Inventory (LCI), collecting all production-related data employed in manufacturing technology, including chemicals, raw materials, and resources utilized in production. This addresses their types and quantities as well as the amount of energy utilized or produced during each manufacturing stage. The type and amount of pollution released by each step of the manufacturing process and waste management is compiled within a scope determined during the targeting phase. This information can be gathered through two methods: directly from the producer or source of the product or through laboratory studies known as primary data. Another option is to leverage existing secondary data from the manufacturing process, then assess the environmental impact.

Environmental impact assessments based on information acquired in a Life Cycle Account section is an important stage of the product life cycle. It begins by categorizing the data as indicators of environmental effects, including a wide range of indicators such as climate change, ozone layer depletion, acidification, ecotoxicity, and the influence on human health. Following that, the effect potential of each indicator is determined in order to quantify the impact of each indicator. This is accomplished through referring to the base substance of an indication. For example, global warming uses carbon dioxide as a base reference substance and acidic conditions use sulfur dioxide. The processes for assessing this effect potential differ depending on the assessment method utilized (e.g., ReCiPe Endpoint, ILCD 2011 Midpoint+, IMPACT 2002+). Each technique has a

thorough computation as well as many indicators that can affect end-point impacts such as human health, ecosystem quality or resource depletion.

De Camillis [22] advocated utilizing LCA principles to examine the environmental impact of tourism businesses. This process results in economically, socially, and environmentally sustainable tourism. Specifically, focusing on such as aspects as reducing greenhouse gas emissions will reduce negative environmental effects. LCA concepts can be used to evaluate all stages of tourist operations from planning to travel, including procedures for visiting tourist attractions and participating in activities. Procedures for leaving tourist attractions and participating in activities following a vacation are also included. A study by Castellani and Sala [23] compares the implementation of LCA-based EIA principles to methodologies for calculating the ecological footprint (EF) of tourism activities and hotel accommodations. Their two case studies were from Italy's northern area. Both techniques (LCA and EF) produced consistent conclusions on the environmental implications of such tourism activities which are frequently related to the use of fossil fuels in the transportation process. Furthermore, Blundo [24] investigated the use of LCA principles in environmental impact assessments for the protection and restoration of cultural heritage assets to ensure their long-term viability. The LCA principle was discovered to be an excellent tool for evaluating such tourist attractions.

Using this LCA EIA approach, Filimonau [25] evaluated the different modes of transportation used on a route from London, England to Marseille in the south of France. The project tried to identify whether private vehicles, trains, buses, or planes release the fewest greenhouse emissions. According to the study, traveling by private automobile and plane emits more greenhouse gases than traveling by rail or coach.

The influence of tourism on the northern Greek vacation hotspot of Chalkidiki was examined by Michailido [26]. Using a Life Cycle Assessment (LCA) approach, this study analyzed the environmental implications of hotel stays in such tourist areas, taking into account variables such as water use, power consumption, trash generation, and greenhouse gas emissions. It was hoped that this study would help identify hot spots in order to develop policies to address problems and improve future plans. Michailido [27] also compared how different life cycle assessment (LCA) approaches evaluated the environmental impact of the same attraction. Approaches analyzed included Ecological Footprint Analysis (EFA) along with other assessment methods such as the Environmental Index (EIs) and Multi-criteria Assessment methodologies (MA). The strategy concentrated on the consumption of resources from both travel and lodging. The findings indicate that this LCA method can be used in conjunction with other assessment methods to develop a tourism policy that has a low environmental impact.

MATERIALS AND METHODS

Research Objectives

- 1. To examine the economic, social, and cultural impacts of tourism and the effects of the current environmental context on six studied areas within the proposed Chiang Mai World Heritage City;
- 2. To analyze the environmental impact of tourism in the selected area through a life cycle assessment (LCA) tool in order to provide concepts for sustainable tourism development; and,
- 3. To provide recommendations for sustainable tourism development in World Heritage-designated regions, particularly in selected heritage sites in Chiang Mai's historic old city.

Research Hypotheses

World heritage tourism in the Old Town district of Chiang Mai will lead to both positive and negative changes in the social and cultural aspects of local communities, as well as in the economy and environment, but these adjustments are required to further develop sustainable tourism in this area.

Population and Sample in the Study

A quantitative mixed method was employed in this study to acquire vital data on the social and cultural repercussions of tourism on aspects of the economy and the environment. Additional information was gathered through interviews with local government authorities and trip providers. All personal information about research participants will be kept confidential. Individuals will not be identified publicly, but the research findings will be reported as general information. There may be a group of people responsible for auditing, such as research funders, institutes, or government organizations, as well as an ethics committee.

Quantitative Research

This study included the following quantitative research tools:

- 1) A questionnaire to research the social, cultural, and economic impacts on local people: 400 surveys were gathered using the Taro Yamane formula based on the number of people in Chiang Mai, Muang District, Chiang Mai. In 2021, this population totaled 1,789,385 people and data were acquired via Multistage Cluster Sampling. Respondents were local people of at least 18 years of age. The second stage was incidental sampling.
- 2) Gather information on environmental implications: The managers of each of the six locations were contacted and the environmental impact was analyzed using a SimaPro software application.

Qualitative Research

The researcher used in-depth semi-structured interviews of population groups as follows:

- 1) A group of ten government employees active in tourism administration.
- 2) Five additional local tourism business groups from sectors such as hotels, souvenir shops and restaurants.

In-depth interviews were conducted in conjunction with documentary research in this qualitative study.

Data Analysis

In this research, data analysis was divided into two methods:

- To forecast sociocultural, economic, and environmental consequences, a quantitative analysis approach with percentage frequency distribution and standard deviation from the questionnaire was employed. This was then evaluated using an LCA tool to uncover environmental impact data.
- 2) A qualitative analytical technique was used, with concerns classified by gathering historical context information from pertinent papers, publications, and interviews. Then, for each category, major and minor points were identified using descriptive analysis. The preliminary analytical hypotheses were used to assess data acquired from the interviews by content analysis. All these procedures can be concluded as conceptual frameworks as shown in Figure 3.

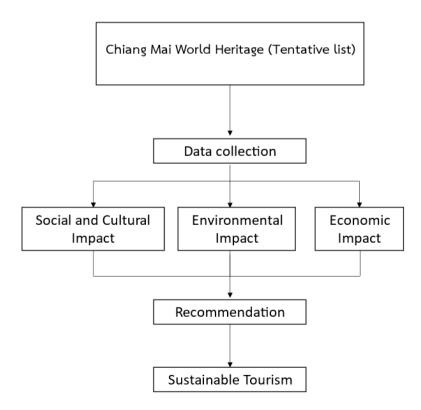


Figure 3. Conceptual frameworks in this research.

Scope of Research

The scope of the study has been limited to Chiang Mai legacy areas proposed for inclusion as World Legacy Sites based on their significant historical and architectural value related to Lanna History Art & Architecture. Wat Phra That Doi Suthep Ratchaworawihan, Wat Phra Singh, Wat Chedi Luang, Wat Prasat, Wat Chiang Man, and Wat Suan Dok are the six temples included in the study. These areas hold great historical importance to the history of Lanna and are currently being researched. It is crucial to preserve these areas as they are a vital cultural heritage for Chiang Mai and Thai national history. Therefore, these six sites were chosen to be the areas studied in this research as shown in Figure 4.

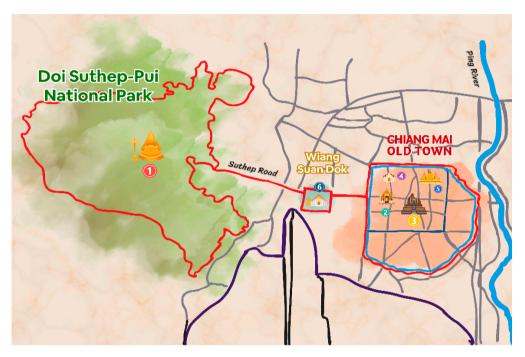


Figure 4. The Chiang Mai Historic City of Thailand showing six tourist destination in this research: (1) Wat Phra That Doi Suthep Ratchaworawihan (2) Wat Phra Singh Worawihan (3) Wat Chedi Luang Worawihan (4) Wat Prasat (5) Wat Chiang Mun (6) Wat Suan Dok (author).

Research Subjects

The demographic scope was divided into three interview target groups as follows:

- 1) ten government officials
- 2) five tourism entrepreneurs
- 3) 400 residents of the Chiang Mai World Heritage Area received a questionnaire

RESULTS

Qualitative Research Findings

In both history and Buddhism, Chiang Mai was an important capital of the Lanna Kingdom. The value and progress of the city are reflected in the

city planning of Chiang Mai with rituals of such beliefs as Buddhism, Hinduism and Animism passed down through the generations. The temples and antique sites reflect the evolution of Lanna art, which is different and charming. This historic city, divided into a city wall, moat, canal, and fortification has retained its historical importance. The majority of the temples within the city walls are regularly used for religious activities. The Fine Arts Department of Chiang Mai University is primarily in charge of conserving and supervising the sites. There is a provincial budget for the promotion of religious activities and conservation through involvement by monks, community leaders, and community scholars who inherit information. There are many temples and landmarks in the city region, which show the local people's dedication to religion. An archaeological site proposed for registration as a World Heritage Site due to its historical and architectural value is the specific subject of this investigation. The circumstances and environmental context of all six historic temples can be briefly explained as follows. There are five ancient temples (Wat Phra Singh, Wat Chedi Luang, Wat Prasat, Wat Chiang Man, and Wat Suan Dok) located in the Old Town district of Chiang Mai. All of these sites are located within community areas and have served as centers for Buddhist religious activities for a long time. Conversely, Wat Phra That Doi Suthep is the only temple located in the Doi Suthep-Pui National Park area, a high mountain surrounded by tropical forest. There are also some communities that have traditionally resided in the area near Wat Phra That Doi Suthep. As a result, the environmental context of this site is different from others, though its roles in the community is still the same. It is a center for Buddhist people in the area as well as a tourist destination. The details of each site are described below.

Wat Phra That Doi Suthep Ratchaworawihan

A significant temple and a primary tourist attraction in Chiang Mai, this Wat is located in the Doi Suthep-Pui district. Since 1972, the historical significance of the relics ensconced on the top has been protected by the construction of a pagoda over them [28]. Visitors can take a cable car up to the top of Doi Suthep for a cost of 30 baht for foreign tourists while Thai tourists pay 20 baht. Prior to the Covid-19 pandemic, the number of tourists was about 4000 people per day Monday-Friday and approximately 6000 people per day on the weekend. Local merchants flock to the area beneath the temple to open souvenir shops for tourists. Development in this area has been controlled, and includes some long-standing residential communities. There are shrines and a monastery within the temple, as well as a place for meditation. The Fine Arts Department of Chiang Mai University has kept records of the modifications. Permission from the Fine Arts Department is required to protect or improve the site, but changes to portions of the temple that are not registered, such as creation of a pavilion, can also change the general landscape. "In the World Heritage registration, we are still uncertain about the rules", temple representatives, local

business owners, and community members remarked. It is sometimes unclear whether the prohibitions against practices of the people in the region, as well as the authority and authority of the temple, are still in effect. Respondents believed that being designated a World Heritage Site will bring more tourists to Chiang Mai; however, they would prefer to have strong planning management in place to accommodate tourists as well.

Wat Phra Singh Woramahaviharn

Wat Phra Singh is an important temple in Chiang Mai that many tourists visit. Chiang Mai's most important Buddha image is housed in this Wat and it is located near Chiang Mai's moat. The temple was built in 1345 and has been certified as the Province's first-class royal temple [29]. According to a temple official, during important Buddhist days Wat Phra Singh Woramahawihan is a focal point of Chiang Mai's events, involving both interested tourists and locals in activities. There is a building control ordinance within the city borders, so locals carefully observe regulations such as building height, distance and building color. Permission from the Fine Arts Department is necessary for some renovations. Tourism related activities around Wat Phra Sing include a Sunday market selling local products near the temple's vihara. The temple administration has also taken steps to encourage visits by tourists such as allowing outsider operators to rent space and open a coffee shop. There are also sacred artifacts available to purchase as keepsakes. In addition, the temple offers native language instruction. Representatives of the temple and business owners have added their thoughts on how a World Heritage Site designation will affect the city's conservation efforts. Business sectors of the Wat have been separated from conservation zones, improving a living city by making it more orderly. However, local residents may be bothered by restrictions on their ability to access or use certain regions. There used to be a tram service for tourists in front of Wat Phra Singh, commencing at the temple and traveling around the city. There is still a tram service, but it only runs on occasion. Problems have also been caused by pickpockets and thieves drawn by the large number of visitors. As a result, additional security has been required. In addition, Wat Phra Singh Woramahawihan instituted a municipal initiative that illuminates the temple at night so that tourists can walk around it. If it is designated as a World Heritage Site, the landscape will be renovated to make it more beautiful. Community sages support and perpetuate local culture through cultural heritage conservation programs. The temple currently does not have a local guide, but the school is working on organizing a tourguide training program so young people will be able to provide tours in multiple languages, including English, Chinese, and Japanese.

Wat Chedi Luang Worawihan

A significant temple in Chiang Mai, this Wat houses the city's largest pagoda. Constructed during the reign of King Saen Mueang, the 7th king of

the Mangrai Dynasty, an Emerald Buddha was transported to the temple to be enshrined upon his arrival. A stunning Naga staircase created by Lanna craftsmen can be found inside the temple. Wat Chedi Luang also offers a city pillar named "Inthakhin Pillar", significant for the worship of Chiang Mai and its people [30]. According to its representatives, the temple has been involved with Buddhist tourism since 2015, when a study of the monastery's monks was initiated. Well-developed systems that are managed in collaboration with the local community are in place to care for tourists that come to see the temple. Prior to the Covid-19 pandemic, roughly 1000 foreign and Thai tourists would arrive each day. Laws and regulations for foreign tourists restrict the number of people entering by levying a ticket charge on those wishing to see the temple. Toilets are available and include facilities for disabled visitors. There are currently no local community guides, but there is an extremely popular chat project in which monks and novices discuss Dharma and Buddhist teachings with foreign tourists.

Wat Prasat

A historical and architecturally significant temple, Luang Pho Phra Prathan's architecture is a valuable Lanna historical landmark. When travelers enter this temple, they notice a white Buddha image in the pose of subduing Mara, with a faith-filled expression on its face. Its original form has been preserved. Wat Prasat was mentioned in a stone inscription of Wat Tapotharam, stating that it has existed since the Lanna Kingdom prospered in 1492 and has been preserved for centuries [31]. According to information from community leaders and temple officials, the landscape has been enhanced for tourism purposes, with external agencies joining the operation. The Prasat Temple hosts major religious activities in which both locals and tourists participate such as Buddhist Lent Days, New Year's Day, and old-fashioned customs. During Songkran, there is a practice of crafting lovely flowers, as well as Satoung, a fate extension ritual. There are no caretakers to help with management of foreign visitors or other tourists to the temple. Wat Prasat has created a QR code sign for tourists to scan and study the history on their own, but the community has yet to organize events to help tourists because it is a small temple with no endowment.

Wat Chiang Man

This site is an ancient temple with historical significance, being the first and the oldest temple in Chiang Mai. It was built by King Mengrai the Great in 1296. The temple contains an elephant Chedi and a significant Buddha image known as Phra Setangkhamani [32]. Chiang Mai residents venerate Wat Chiang Man. According to a temple spokesman, the site is currently being restored and conserved by the Fine Arts Department. The temple has made the surrounding environment. a main focus of visitors, more beautiful. Wat Chiang Man is often included in tours offered by travel

agencies, although there are no guides on site. Some areas are off-limits to women and/or tourists, but visitors are allowed to go around the rest of the temple site. There aren't many tourist attractions at the temple. There are special traditions associated with important days like the Lottery Festival. Merit-making by the people of Chiang Mai also takes place at this major temple. The temple's souvenir shop sells sacred items worshiped by the community to help raise revenue.

Wat Suan Dok

Chiang Mai's most prominent ancient temple, about 650 years old, houses Lord Buddha relics. In addition, relics of northern and many Chiang Mai rulers are kept here. Because it was once part of a Burmese colony, sections of the Wat, now a Sri Lankan-Sukhothai style pagoda, show a Burmese influence. Inside the temple there is a big cast Buddha image called Phra Jao Kao Thue, a metal structure created by the Meng Rai dynasty in 1504 B.E. that has been repaired. The Fine Arts Department has designated it as a national antique. It is the main Buddha image in the royal hall and the largest Buddha statue in Lanna [33]. According to academic interviews, Wat Suan Dok is undergoing conservation efforts, with the Suan Dok city wall scheduled for restoration to promote traditional community tourism, such as the candle procession tradition and Songkran, during religious holidays. There used to be an historic forge in the community, but the skill needed to operate this equipment has not been passed down. The temple is primarily concerned with tourism, which represents the community's identity. In addition, some tourists come to follow the legend of Ma Mie's love Chao Noi Sukkasem, and they bring roses to pay honor to him.

Quantitative Research Findings

As previously stated, sustainable tourism is composed of three major factors: economic, social and environmental. In order to measure the impact of tourism on each category, questionnaires were used to collect quantitative data. A slim majority of locals (51.6%) were aware of the nomination procedure for Chiang Mai's World Heritage Site. Locals are generally captivated by cultural heritage monuments with historical and artistic architectural value. The most impressive place for the locals was Wat Phra That Doi Suthep with 82%, followed by Wat Phra Sing Worawiharn (57.6%), Wat Chedi Luang (55.2%), Wat Suan Dok (43%), Wat Chiang Man (15.7%), and Wat Prasat (10.5%.) Locals believe that there should be a clear zoning area management because of the high number of tourists who enter temple areas. The city management plan for the area measures visitor capacity and handles legal management. Rotating exhibitions in temple areas of the ancient sites should be a source of learning, enabling both locals and tourists to understand the impact of economic, social, and cultural, and environmental issues. Each type is explained below.

Economic impacts

Respondents to the questionnaire were asked about their expectations of the consequences of receiving a World Heritage Site designation. About 72% of respondents thought that more tourists would visit Chiang Mai, followed by those who predicted economic development and a boost in Chiang Mai's revenue (69%). Others expected increases in local people's income (67%), more jobs in the tourism sector (62%), increased general employment (58%) and higher income distributions to the community (57%) as shown in Figure 5. The most significant negative economic impacts described included a price increase in tourist items (56%). It was also feared that investors in tourism businesses in the vicinity may have conflicts of interest (44%) and that the local resident's cost of living would be higher (35%) as shown in Figure 6.

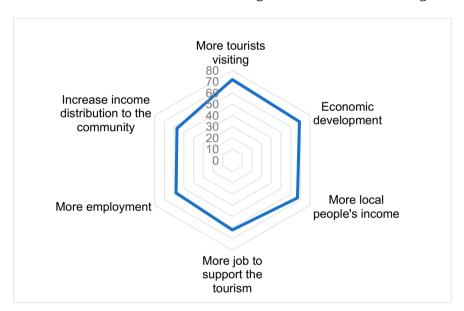


Figure 5. Positive economic impacts of designation on Chiang Mai tourism.

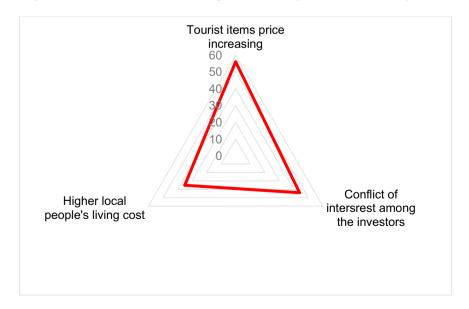


Figure 6. Negative economic impacts of designation on Chiang Mai tourism.

Social and cultural impacts

The questionnaire also addressed the implications of a spread of local cultural assets to a wider area. Among the respondents, 55% believed it would have a beneficial social and cultural impact. In addition, almost half stated that it would contribute to the preservation and inheritance of local cultural heritage resources (49%), and make local people proud of their local cultural heritage (48%). The fewest number of respondents believed in a more positive relationship between tourists and the community (33%) as shown in Figure 7. The biggest detrimental social and cultural consequences of an increase in tourism is that precious cultural heritage would become a tourism product (33%), change the local culture (23%) or be linked to ethical and criminal issues (22%). Additional potential negative implications cited include changes in tourist attraction facilities to welcome more tourists (19%) and unwelcome effects in local people's daily lives (17%) as shown in Figure 8.

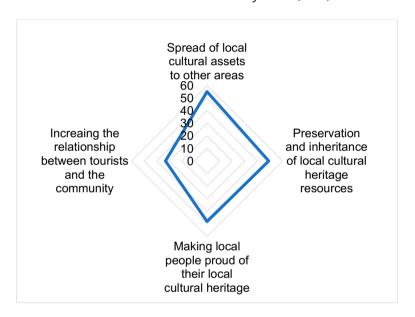


Figure 7. Positive social impact of designation on Chiang Mai tourism.



Figure 8. Negative social impacts from Chiang Mai tourism.

Environmental impacts

Based on a survey, several local residents described potentially positive environmental impacts. The majority of respondents claimed that ancient sites should have better ecological management (37%), create more environmentally friendly souvenirs (36%), have better solid waste management in tourist attractions (35%), ensure constructed buildings are consistent with an historic city (34%) and have an efficient wastewater treatment system (33%) as shown in Figure 9. However, they believed there will be negative ramifications includes non-biodegradable trash from tourist sites (48%), deteriorated and disorderly tourist attractions (33%), and more air pollution (32%). A minority was concerned about lack of capacity due to a larger number of tourists (22%) as shown in Figure 10.

In order to assess the environmental impact, researchers used information from questionnaires, interviews, and data collected from other sources such as sub-district municipalities. The environmental impact was studied from 2022–2023. The most important impact indicators originating from the tourism of all six temples were discovered by utilizing an LCA tool and the ReCiPe Midpoint (H) analysis approach.

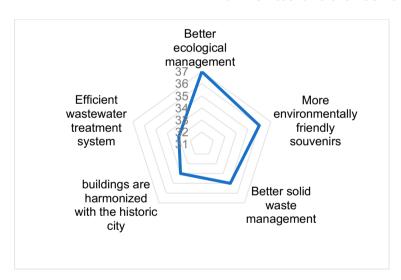


Figure 9. Positive environmental impacts of Chiang Mai tourism.

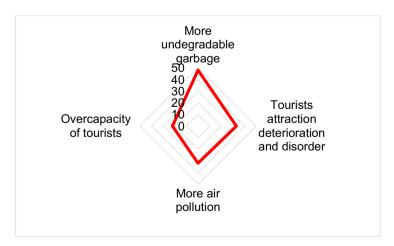


Figure 10. Negative environmental impacts of Chiang Mai tourism.

Global warming indicators

An analysis of global warming indicators showed that Wat Phra That Doi Suthep had the greatest impact in this category. As illustrated in Figure 11, this impact equates to 2,033,407 kg of CO₂ annually. This finding was followed by Wat Chedi Luang (431,327 kg CO₂e per year), Wat Phra Singh (143,774 kg CO₂e per year), Suan Dok Temple (129,399 kg CO₂eq per year), Wat Chiang Man (28,756 kg CO₂eq per year), and Prasat Temple (21,569 kg CO₂e per year). All these results can be shown in Figure 11.

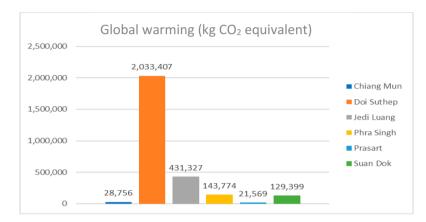


Figure 11. Global warming impact from six tourist destinations in Chiang Mai.

Terrestrial ecotoxicity index

An analysis of soil contamination indicators found that Wat Phra That Doi Suthep has the most influence in this category. It produced 3,118,953 kg 1,4 dichlorobenzene equivalent per year when compared to the toxicity of 1,4 dichlorobenzene (1,4 DCB). Lesser amounts were found in Wat Chedi Luang (661,593 kg 1,4 dichlorobenzene equivalent per year), Wat Phra Singh (220,528 kg 1,4 dichlorobenzene equivalent per year), Suan Dok Temple (198,479 kg 1,4 dichlorobenzene equivalent per year), Wat Chiang Man (44,108 kg 1,4 dichlorobenzene equivalent per year) and Wat Prasat (33,083 kg 1,4 dichlorobenzene equivalent per year), respectively (see Figure 12).

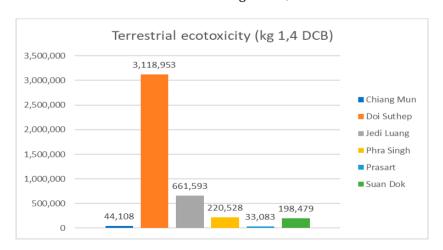


Figure 12. Terrestrial ecotoxicity impact of six tourist destinations in Chiang Mai.

Freshwater ecotoxicity index

According to results of pollution indices from fresh water sources, Wat Phra That Doi Suthep continues to have the highest levels. In comparison to the toxicity of 1,4 dichlorobenzene equivalent per year is 1339 kg 1,4 dichlorobenzene equivalent. As shown in Figure 13, Wat Chedi Luang has (284 kg 1,4 dichlorobenzene equivalent per year), as compared with Wat Phra Singh (94 kg 1,4 dichlorobenzene equivalent per year), Suan Dok Temple (85 kg 1,4 dichlorobenzene equivalent per year), Wat Chiang Man (18 kg 1,4 dichlorobenzene equivalent per year), and Wat Prasat (14 kg 1,4 dichlorobenzene equivalent per year) as shown in Figure 13.

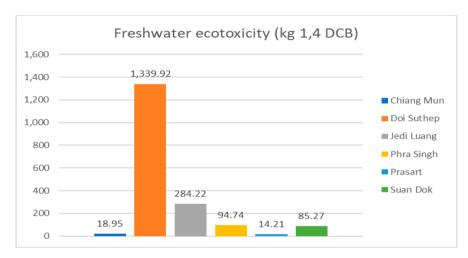


Figure 13. Freshwater ecotoxicity impact from six tourist destinations in Chiang Mai.

DISCUSSION

In order to evaluate sustainability of development, this research project focused on the environmental, economic, and social consequences of tourism attractions in the Old Town section of Chiang Mai Province's proposed World Heritage site. There were both positive and negative outcomes found by this social and cultural study based on quantitative and qualitative research findings. Consistent with findings from Tantiseranee [11] and Hosseini [12], most locals considered the development of Chiang Mai's ancient city as propagation and inheritance of a cultural legacy, resulting in a close relationship with the community. Furthermore, World Heritage tourism within developing countries leads to maintenance of attractions, supporting conservation and participation of a true community. This is also consistent with Srakawee [14], which indicates that social benefits will result in a durable inheritance. Research conducted by Ariza-Montres [15] addressed local people's desire to conserve cultural assets and establish sustainable tourism policies. Furthermore, when asked about potential social and cultural consequences of tourism, research has shown that visitors are most concerned about valuable cultural heritage becoming a product of tourism [11]. Tourists' acceptance of culture shapes local communities. The transition coincided with the appearance of ethical and criminal

issues which may impact daily life and society. This is consistent with Adulviroj [16] findings. According to these findings, results can be divided into three impact categories.

- 1. **Economic Impact**: Tourism is crucial to generating income for local economies. According to tourism economic theory, tourism can distribute income and create opportunities for local communities. This study found that World Heritage tourism in Chiang Mai's Old City could promote economic growth, resulting in increased income and employment. The best economic benefit is its potential for increasing the number of tourists that come to Chiang Mai, promoting economic development and boosting local income. This is consistent with the findings of Torre [17], Kronenberg [18] and Gonzalles-Mantilla [19]. However, it also revealed negative impacts, such as higher living costs for locals, increased business competition, and the risk of economic inequality caused by improper destination management. Inappropriate planning frameworks in the sites may result in some of the negative impacts that local residents are concerned about, leading to more expensive products as well as a higher cost of living. This aligns with the study by Hosseini [12], which found that World Heritage tourism in developing countries positively affects the economy but requires measures to prevent and mitigate the resulting negative impacts.
- 2. Social and Cultural Impact: Cultural tourism can promote heritage conservation and raise awareness among local communities. The research found that World Heritage tourism in Chiang Mai's Old City encourages cultural exchanges, the preservation of local traditions and culture, and fosters community pride. These findings align with a study by Srakawee [14] which found that community-based tourism leads to new skills and promotes cultural sustainability. However, the study also revealed negative impacts, such as lifestyle changes, the commodification of local culture, and risks related to ethics and crime.
- 3. **Environmental Impact**: According to findings of environmental impact studies based on the concept of LCA [20], Wat Phra That Doi Suthep had the largest annual environmental impact caused by tourism. It had the biggest influence on the four indices of global warming, soil pollution, and fresh water pollution. This is because the number of tourists visiting Wat Phra That Doi Suthep is substantially larger than those of other temples, with 4000–5000 visitors per day in 2022–2023. This is significantly greater than the approximately 200–800 tourists who visit other temples daily. As a result, large amounts of resources such as water and electricity are required, generating an increased amount of waste, influencing the environmental impact index. This is

consistent with the organization's lifecycle evaluation theory. The temples with the next largest environmental impacts are Wat Chedi Luang and Wat Phra Singh. Despite the fact that slightly more tourists visit Wat Phra Singh than Wat Chedi Luang, Wat Phra Singh's electricity use is lower (22,000 units/month) while Wat Chedi Luang's consumption is approximately 67,000 units per month. As a result, Wat Chedi Luang has a greater environmental effect index than Wat Phra Singh. However, the quantity of electricity used does not simply measure the electricity consumed by tourist activities but includes utilities used by monks and novices at the temple. Wat Suan Dok, Wat Chiang Man, and Wat Prasat, the remaining temples, all have poorer environmental indices and their levels are based on the number of tourists who visit each temple.

The sample questionnaires revealed both positive and negative features regarding environmental consequences. Local residents agreed that better management of archaeological site environments is the most likely positive outcome. The production of ecologically friendly souvenirs and improvement of solid waste management in tourist destinations was also cited as a benefit. To improve environmental indices, planners should be more focused on the management of tourist sites based on community feedback. The most significant negative environmental impact described was the presence of non-biodegradable trash in tourist sites. In addition, some tourism attractions are in disrepair. These are concerns that the community believes should be addressed in order to deal with problems that will occur or worsen if more tourists come to visit in the future.

Sustainable tourism aims to balance economic, social, and environmental aspects [9]. The research proposes sustainable tourism development strategies for Chiang Mai, including local economic management, cultural heritage conservation, environmental management, and strategic policies and measures. This aligns with Ariza-Montres [15], who advocate for using SROI to assess tourism sustainability. Overall, this research demonstrates the significance of World Heritage tourism in Chiang Mai's Old City and the need for sustainable tourism development. Although tourism positively impacts the economy, society, and culture, negative impacts must be carefully managed, particularly environmental ones. This study has some limitations but can serve as an essential database for future sustainable tourism policy development.

CONCLUSION

(1) This study addresses the economic, social, and cultural impacts of tourism and the current environmental status of six areas within the proposed Chiang Mai World Heritage City.

According to research data, the World Heritage area in Chiang Mai is divided into zones reflecting the importance of history and art, architecture and cultural heritage sites in the old city. It includes six temples: Wat Phra That Doi Suthep, Wat Phra Singh, Wat Chedi Luang, Wat Prasat, Wat Chiang Man, Wat Suan Dok and Wat Phra That Doi Suthep Ratchaworawihan.

Of all these temples, Wat Phra That Doi Suthep Ratchaworawihan is the most important and well-known temple in Chiang Mai, and is the only temple not located in the Old Town district. It is also the most popular tourist site, with cultural harmony between nature and the local and ethnic people. As a result, tourism and administration are relatively well-supported, including gifts from the community.

Wat Phra Singh Woramahawihan is a popular tourist destination with exquisite architecture. Tourists may get there easily and quickly from the moat area as it is close to other significant sites in the city center. On Sundays, a community cultural fair sells souvenirs and instructors teach local languages.

Wat Chedi Luang, a temple with exquisite architecture and home to the Inthakhin Pillar, is the next most popular tourist attraction. Throughout the year, tourism activities are planned. In addition, the number of community management activities, such as a light show with Chiang Mai University's Faculty of Architecture, have increased as a result of religious holy days and the engagement of community leaders.

Next, tourists come to admire the beauty of Wat Suan Dok. Some come to ask for love blessings because of the Ma Miew legend, a literary story that connects mythology to the present day.

Wat Chiang Man is popular with both independent tourists (FIT) and those who travel with agencies as it was the first temple in Chiang Mai. The architecture has been retained in its original state.

According to study data and assessments by local people, an increase in the number of tourists visiting Chiang Mai will have the greatest economic consequences, both positive and negative. It will generate economic progress and raise income levels in Chiang Mai, allowing locals to earn more. More jobs in the tourism and travel sector generate higher levels of employment and increase revenue distribution in the neighborhoods. Increases in tourist item prices is considered the most serious economic problem, followed by conflicts of interest among investors in area tourism businesses and increases in the cost of living.

The most positive social and cultural influence has been the spread of local heritage to other locations. This has contributed to the preservation and transmission of local cultural heritage materials, made locals proud of their legacy and fostered positive relationships between tourists and the community. The most negative aspect for communities is a fear that their valuable cultural heritage will become a tourism product. In addition, acceptance from tourists may cause local cultures to change, potentially causing ethical and criminal problems. There was also concern that

improving facilities in tourist attractions to accommodate visitors will affect daily life.

- (2) When using an LCA approach to evaluate environmental impact, it was discovered that Wat Phra That Doi Suthep has a significant climatic impact, potentially contributing to global warming. As the greatest number of tourists visit this temple annually, it generates the most pollution. As a result, there should be a management strategy to ensure appropriate procedures are in place. Local residents anticipated that the greatest environmental benefit in ancient monuments will be generated through ecosystem management, whereas they believed the most negative impact would be increased trash generated by visitors. Therefore, in order to promote sustainable tourism, it will be necessary to improve waste management for each tourist destination as well as limit the number of visitors to famous places such as Wat Phra That Doi Suthep and Wat Phra Singh Woramahawihan.
- (3) This study has provided suggestions for sustainable tourism development in the World Heritage-designated region, an important area of history and art, architecture, and cultural heritage sites in Chiang Mai's historic city. To accomplish sustainable development, involvement by government agencies, commercial sectors, and community members is required. Priority should be placed on conservation according to UNESCO standards. There is a strategy for both area management and enhanced activities in cultural tourism sites, such as providing transportation, historical narratives, interpretation, restroom access and rubbish bins within the World Heritage city. Additional research recommendations for the management of key historical and architectural World Heritage and cultural heritage sites follow.
- a. Advance planning is required for future tourism to the six temples with an area overview and related activities. Administration, tourists, business owners, and residents should be required to abide by city or community rules of conduct, such as local ordinances. In addition, the administration of a World Heritage City should define distinct zoning rules indicating which areas should be safeguarded, designated as buffer zones, or offer community or city tourism activities.
- Travel within the World Heritage Site to tourist attractions in the archaeological region should be organized. For example, regulations should be in place for tourists who want to travel independently by foot, bicycle, or tram.
- Interpretation: Every temple should have significant signage, including QR codes that explain historical facts in different languages such as English, Chinese, and Japanese. The design should be in harmony with the World Heritage City's surroundings.
- Providing education: According to information gained from in-depth interviews, most sites do not have local tour guides sufficiently educated about temples, ancient places, or adjacent communities so

- they are unable to adequately pass this information to visitors. Providing guides with required skills would increase income to the temple as well as the community.
- Landscapes and city views: Activities that do not harm or pollute the environment should be planned, and building designs should be adjusted to blend in with the urban landscape. Building height should be controlled in accordance with the Chiang Mai City Planning Acts of 2011, 2012 and 2013.
- Supporting activities: Amenities such as adequate parking should be offered to ensure that tourists can park their cars in the vicinity without polluting the old city. Restroom facilities should be provided and kept clean, well-marked to inform tourists of the locations. They should be designed to blend in with the atmosphere of the ancient temple, creating beauty rather than destroying it.
- Tourists should have access to enough garbage cans, and the art at each location should mix in with the ancient temples.
- Souvenir shops should have a variety of designs that reflect the area's
 identity, offering sacred objects important to each temple or ancient
 location. Communities may work together to generate income for the
 community.
- b. Participation: The involvement of local people in the process is critical to the development of the city as a World Historic site. Operators of tourist and government agencies should work together on decision-making, actions, interests, and evaluations. This will make urban development and conservation actions more sustainable.
- c. Cultural tourism management for long-term viability: This research is being conducted in anticipation of Chiang Mai being designated as a World Heritage site, resulting in a significant number of tourists visiting the area. A strategy for enhancing cultural resources such as temples, ancient sites, activities, and tourism products should be developed to attain sustainability in all three areas. The environment should be protected by using resources wisely and ensuring that land and water are not polluted. Profitability should be enhanced and provide benefits to many local sectors. Social and cultural sustainability must not deplete resources; rather, resources must be preserved in order for future generations to inherit their culture.
- d. Management principles for reducing environmental effects: Tourist attractions with a high number of visitors require a better management system. This should include management of various resources such as water and energy, a system focused on the management of ancient site ecosystems, and a management system to handle trash generated at tourist attractions.

LIMITATIONS OF THIS RESEARCH

- 1. **Data Limitations:** The data used in this research may not cover all aspects of the issue. Quantitative and qualitative data rely on survey responses and interviews, which may introduce bias.
- 2. **Sampling Limitations:** The selection of the sample may not have included all groups affected by tourism in the Old Town district of Chiang Mai and in-depth interview data may present subjective information influenced by the interviewee's experiences.
- 3. **Geographical Limitations:** This research focuses solely on the impacts in the Old Town district of Chiang Mai, so findings may not apply to other cities with different environments or cultures.
- 4. **Environmental Impact Analysis Limitations:** Using the Life Cycle Assessment (LCA) tool to analyze environmental impacts may have limitations due to inadequacies in data collection and analysis accuracy.

DATA AVAILABILITY

The dataset of the study is available from authors upon reasonable request.

AUTHOR CONTRIBUTIONS

Somnuxpong and Chiarasumran jointly conceived the idea for this research project and collected data together. Somnuxpong performed qualitative and quantitative analysis of data related to economic, social and cultural impacts and writing the manuscript. Chiarasumran conducted a quantitative analysis of data related to the environmental impacts and writing the manuscript.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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