

Article

Impact of Tourism Growth on the Changing Landscape of a World Heritage Site: Case of Luang Prabang, Lao PDR

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Received: 2 October 2017; Accepted: 27 October 2017; Published: 1 November 2017

Abstract: Rapid tourism development adversely impacts and negatively transforms World Heritage Sites. This study aimed at examining how tourism growth has impacted the built environment of Luang Prabang, Lao PDR through an empirical approach. Luang Prabang has received a critical warning from World Heritage Committee for the escalating development pressure on its vulnerable landscape. Hence, this study examined two aspects: (1) the spatial pattern of the increase of touristic usage; and (2) the relation between the increase of touristic usage and the significant changes in the built environment. For this, geographical information systems (GIS) are combined with statistical methods such as logistic regression and chi-square test of independence. The results affirmed that the change from other types of usage to touristic usage in existing buildings has a higher chance to occur along riverbank areas than in the middle of the peninsula in the core heritage area. Change to touristic usage is also related with three significant changes in the built environment, namely: (1) change from other types of architecture to Lao traditional architecture; (2) change from modern to traditional roof materials; and (3) change from traditional to modern building materials. This indicates that the increase in touristic usage has contributed to strengthening the heritage elements of the landscape.

Keywords: tourism; World Heritage Site; built environment; GIS; statistics for categorical variables; Luang Prabang

1. Introduction

Tourism has been growing rapidly in World Heritage Sites due to the sharp influx of tourists. Commercialization occurred in almost all sites after becoming World Heritage Sites [1]. Urbanization, the global scale of tourism, and the marketing of heritage as a product are observed in World Heritage Sites [2]. The consequence of increased popularity and the government's continuous interest to promote tourism is the degradation of the site [3]. It is often argued that conflict of interest made it difficult to balance between development and conservation. However, there are those who maintained that both conservation and development could coexist and support each other [4].

Tourism growth often triggers rapid urban development and modernization [1,5]. The need to cater to tourism outweighs the needs of local residents [1]. Developers tend to build according to market needs rather than preserving the traditional landscape of heritage sites [5]. In ICOMOS' analysis of 1570 threats faced by 614 World Heritage Sites, the negative effects of urban development

identified are destruction of traditional or vernacular buildings, construction of bigger and higher buildings, construction of modern houses, encroachment, waste pollution, and more [6].

There are cases of Historical Urban Landscapes (HULs) in Asian developing countries impacted by tourism growth and urban development pressure, such as Old Town of Lijiang of China, Melaka and George Town of Malaysia, Hoi An Ancient Town of Vietnam, and the Historic Center of Macao SAR of China. Since becoming World Heritage Sites, these historic cities have experienced a sharp inflow of tourists [5,7–12]. As a consequence, touristic-related facilities were rapidly constructed, for example, hotels, shops, luxury apartments, and others. Large-scale development, expansion of built land, and construction of modern high-rise buildings took place [5,7–12]. At the same time, many residential houses were converted for touristic usage. In Lijiang and Hoi An, the conversion of building usage resulted in gentrification where the original population declined and were replaced by local investors from other parts of the country [1,12]. Moreover, buildings were changing rapidly in both cities because of fast-paced and uncoordinated constructions [5,8,11,12]. Much of the historical land in Lijiang was lost, and only a few historic buildings remained due to urban sprawl [8]. In the case of Macao SAR, the built environment has been transformed tremendously with large-scale developments, especially the construction of casinos and high-rise buildings, which has affected the visual integrity of the heritage site [7]. It is observed in these cases that tourism growth followed by development pressure and modernization, have negatively transformed the HUL.

It is challenging and complex to sustain an evolving heritage site, especially in Asian developing countries. Sustainability in a tangible heritage context is stated as “ensuring the continuation of contribution of heritage to the present through the thoughtful management of change responsive to the historic environment and to the social cultural process that created it” [13] (p. viii). Management of change and continuity of heritage are only made possible by first grasping how heritage is being lost and what factors are involved [13]. It is further elucidated that managing change is to identify the limit of tolerable change according to the carrying capacity of a World Heritage Site [14,15]. As such, it is important to examine how heritage sites evolve over time and their capacity to manage the impacts of tourism growth. Although there are numerous studies on the economic and socio-cultural impacts of tourism on heritage in general, there is a lack of studies on the impact of tourism on heritage in an Asian context [7]. Moreover, there are insufficient empirical studies to adequately address the relation between tourism pressure and changes in Asian heritage sites.

This study looks at the case of the HUL of Luang Prabang, Lao PDR. The World Heritage Site faced an escalating number of tourist arrivals, and there are conflicting findings on the severity of the impact of tourism growth [16]. Although the majority of the literature has reported that Luang Prabang has changed negatively [17–22], some of them [17–19] are considered as too critical [23] and others maintained that the town is still being preserved [24,25]. In order to obtain evidence to ascertain the state of preservation of Luang Prabang, the built environment of a pilot area was analyzed using geographical information systems (GIS) based on key indicators, and the reasons behind significant changes were investigated from the local stakeholders’ perspective [16]. It was found that the pilot area in the core heritage area has changed significantly within the limits of preservation regulation. However, a question arises as to whether the significant changes identified are contributed by tourism. Therefore, this study aims to shed light and reveal how the increase of touristic buildings has affected Luang Prabang by: (1) examining the spatial pattern of the increase of touristic buildings; and (2) examining the relation between the increase of touristic usage and significant changes in the built environment. GIS and statistical approaches for categorical variables are combined to examine and validate the aforementioned relationship.

2. The Case Study

The case study focuses on the town of Luang Prabang, located in the north of Lao PDR. Luang Prabang comprises a HUL nestled between two rivers—Mekong and Nam Khan. The town became a World Heritage Site in 1995 based on the criteria (ii), (iv), and (v) [26]. Luang Prabang was an ancient

royal city known as the former capital of the Kingdom of Lan Xang. During the pre-colonial era, Laotians settled there according to the influence of Theravada Buddhism and natural physical layout such as water, rock, and tree [27]. Later, the town layout was formed over several years based on exchange between Lao, Vietnamese, and French influences. The heritage site is recognized for its unique urban landscape and beautiful natural environment of lush mountains and rivers, as shown in Figure 1. It is rich with religious architecture [28]. There are thirty-four monasteries that still play an important spiritual role for the local communities. The core heritage area is located in a strip of the peninsula about 1 km long and 250 m wide [27]. The peninsula, positioned on elevated bed rock, is the political and cultural heart of the town. The Lao government collaborated with the French government to develop a conservation framework, which included drawing the Safeguarding and Preservation Plan (Plan de Sauvegard et de Mise en Valeur (PSMV)) and establishing the local heritage office, Luang Prabang Department of World Heritage Site (La Department du Patrimoine Luang Prabang (DPL)) [28,29].



Figure 1. The peninsula of Luang Prabang, surrounded by the Nam Khan River (left) and the Mekong River (right) [30]

Engelhardt, in his essay for the book entitled *Luang Phabang, an Architectural Journey*, cautioned that tourism is a double-edged sword [27]. If tourism grows unregulated, it could have adverse impacts on the heritage site. In fact, the trend of tourism growth in Luang Prabang has drawn a stern warning from the World Heritage Committee [19]. The development has reached the threshold level and asserted severe pressure on the landscape of Luang Prabang. Since the town became a World Heritage Site, it has received unprecedented numbers of tourist arrivals. Figures 2 and 3 illustrate the number of tourists and touristic buildings in Luang Prabang from 1997 to 2016, respectively. The earliest record in 1997 shows that total number of tourists visiting the site was 62,348 [31]. By 2016, the number soared 890% to 617,239. The rapid increase in tourist arrivals is contributed significantly by foreign tourists. The expansion of the airport runway in 2012 enabled larger aircrafts to land and increased capacity to receive more tourists [32,33]. Similarly, there was a boom in construction of touristic buildings, such as guesthouses, hotels, restaurants, tourist shops, and tour agencies. The number of touristic buildings jumped by 803% from 87 in 1997 to 786 in 2016. Among them, guesthouses and restaurants are the most dominant type of touristic buildings constructed over the years to fulfill the increasing demand of tourism. There are diverse views in perceiving the impact of tourism growth and how it changes the landscape of Luang Prabang due to a lack of empirical evidence to verify the actual situation [16] and quantify how the increase of touristic buildings has affected or altered the landscape.

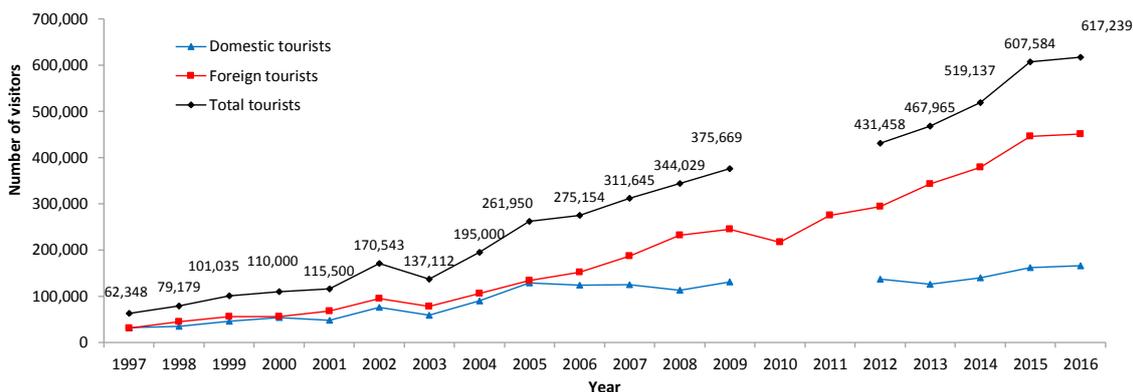


Figure 2. Number of domestic and foreign tourists arrival in Luang Prabang from 1997 to 2016 [31]. Note: Total number of tourists in 2010 and 2011 were unknown due to missing data of domestic tourists in 2010 and 2011.

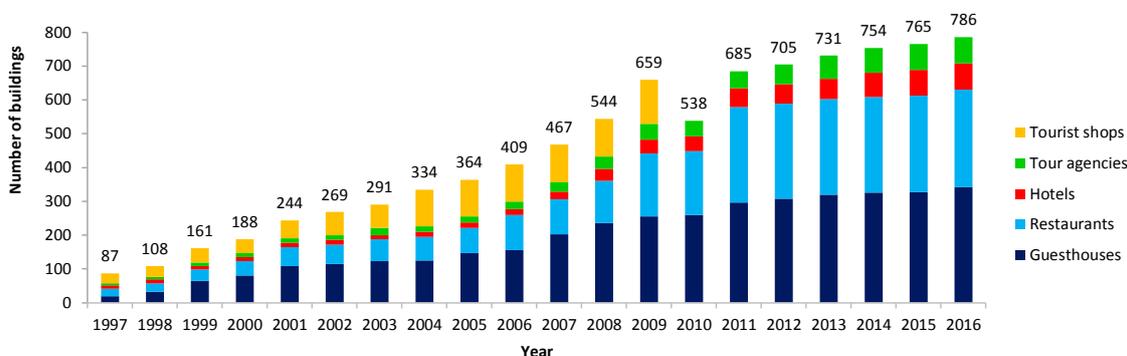


Figure 3. Number of touristic buildings in Luang Prabang from 1997 to 2016 [31]. Note: Data of tourist shops were unknown from 2010 onwards. Total number of buildings did not include tourist shops from 2010 onwards.

3. Methodology

3.1. Significant Changes in Built Environment

GIS were applied to visualize and examine the significant changes in the built environment of a pilot site in Luang Prabang [16]. The pilot site consisted of six villages in the core heritage area. The change in the built environment between 1999 and 2009 was analyzed based on seven key indicators of change adopted from PSMV. Later, a workshop was conducted with seven local experts from DPL to interpret the changes. The spatial analysis identified that four indicators—namely, building usage, architecture, building materials, and roof materials—have changed significantly, while the other three indicators—building height, building area size, and building condition—did not change significantly. The significant changes were contributed by both existing buildings and newly constructed buildings, as summarized in Table 1.

Table 1. Significant changes in the built environment of Luang Prabang

Indicators [28,29]	Description [28,29]	Change	Spatial Distribution
Building usage	Building function utilized for public and private purposes	Increase of touristic usage contributed by converted residential buildings and construction of new touristic buildings	Increased along riverbanks
Building architecture	Building typology derived from Lao vernacular architecture and the architecture of foreign influences	Increase of Lao traditional architecture contributed by converted modern architecture and construction of new Lao traditional architecture	Increased along riverbanks
Building materials	Materials used to construct building structure	Increased use of modern materials contributed by change from traditional materials and construction of new buildings using modern materials	Increased throughout the peninsula
Roof materials	Materials used to construct roof structure	Increase of traditional roof materials contributed by converted modern roof buildings and construction of traditional roof buildings	Increased throughout the peninsula

The results obtained from the spatial analysis served as a basis to derive further analysis. GIS were combined with statistical methods to validate the results obtained. The statistical methods for categorical data are useful for this study since the majority of building attributes are categorical data. Logistic regression was used to validate the spatial pattern of changes [34,35], and a chi-square test of independence to find out the relation between touristic usage and significant changes in the built environment [36]. The entire cohort of buildings in the six villages was analyzed. The buildings were divided into two types, namely, existing buildings ($n = 657$) and new buildings ($n = 88$).

3.2. Spatial Pattern of Increase of Touristic Usage

A logistic regression was employed to validate the spatial pattern of increase of touristic usage in the built environment [34,35]. R software was used for the analysis [37]. The logistic regression analyzes the relationship between a categorical dependent variable and one or more independent variables [38]. The logistic regression model can be expressed as

$$\text{Logit}(P) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 x_1 + \dots + \beta_i x_i + \dots + \beta_n x_n \quad (1)$$

where $\ln\left(\frac{P}{1-P}\right)$ is the log odds ratio; P , probability; β_i , coefficient; and x_i , independent variable [35].

It is observed in GIS' spatial analysis that conversion from residential to touristic usage and new touristic buildings occurred along riverbank areas [16]. Logistic regression was used to examine whether increase of touristic usage is more inclined to happen along riverbanks or in the middle of the peninsula. Location was chosen as the independent variable, with the buildings located along riverbanks set equal to 1, and those in the middle of peninsula set equal to 0. Figure 4 distinguishes the different locations of the buildings in the pilot site. As for the dependent variable, existing buildings that changed from other types of usage to touristic usage ($USAGE_{\text{existing}}$) were coded with binary value 1 and all other existing buildings were coded as 0. Similarly, for new buildings ($USAGE_{\text{new}}$), new buildings used for touristic purpose were assigned as 1, and those used for non-touristic purposes were assigned as 0.

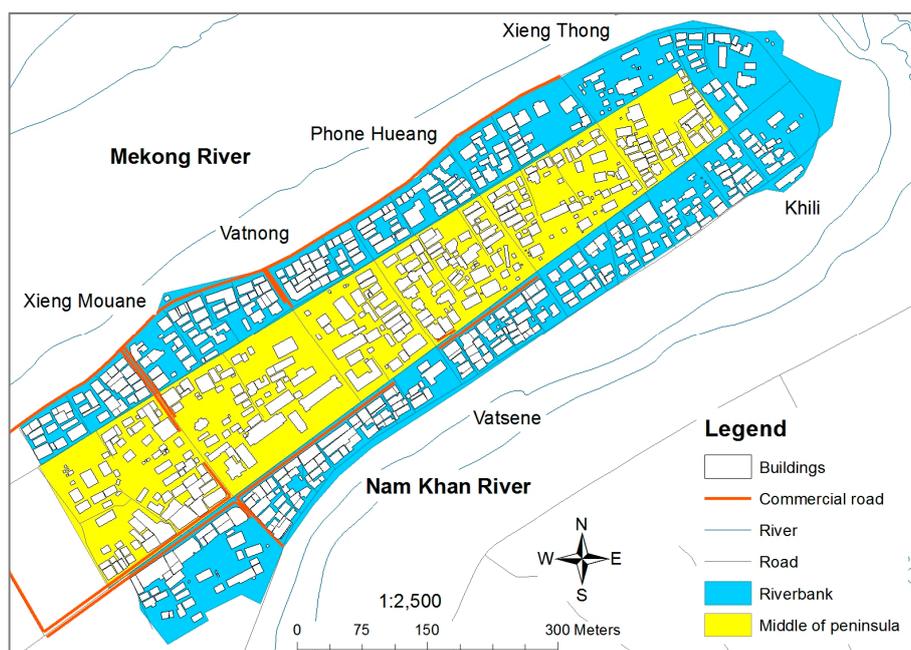


Figure 4. Buildings located along riverbank and middle of peninsula in the pilot site of Luang Prabang World Heritage Site

3.3. Relation between Touristic Usage and Significant Changes in the Built Environment

The relationship between an increase in touristic usage and significant changes in the built environment was analyzed using a chi-square test of independence [36]. A chi-square test of independence is used to analyze pairs of categorical variables to determine whether they are dependent or independent from each other. It assumes the null hypothesis that two variables are independent. The data are coded with binary values. In the case of existing buildings, the variables were coded from the results of the spatial analysis in Table 1 as follows:

- Usage ($USAGE_{existing}$): Buildings that changed from other types of usage to touristic usage are equal to 1, and all other buildings are equal to 0.
- Architecture ($ARCH_{existing}$): Buildings that changed from other types of architecture to Lao traditional architecture coded as 1, and all other buildings as 0.
- Building materials ($MAT_{existing}$): Buildings that changed from traditional to modern materials assigned as 1, and all other buildings as 0.
- Roof materials ($ROOF_{existing}$): Buildings that changed from modern to traditional roof materials assigned as 1, and all other buildings as 0.

The same method was employed for new buildings. New buildings used for touristic purposes ($USAGE_{new}$), with Lao traditional architecture ($ARCH_{new}$), with modern materials (MAT_{new}), or with traditional roof materials ($ROOF_{new}$) were each coded as 1, respectively. Other non-significant attributes were coded as 0.

4. Results and Discussion

The results are divided into two sections: (1) spatial pattern of increase of touristic usage; and (2) relation between increase of touristic usage and significant changes in the built environment.

4.1. Spatial Pattern of Increase of Touristic Usage

The most significant spatial pattern observed in GIS is the increase of touristic buildings along riverbanks. This result was verified using the logistic regression model. Table 2 shows the

estimation results of existing buildings that have changed to touristic usage and new touristic buildings constructed along the riverbanks. The result of the model for the $USAGE_{existing}$ variable is statistically significant, with a p-value lower than 0.05. The coefficient has a positive value indicating that the change to touristic usage is related to location. Existing buildings located along riverbanks have 2.32 times higher odds than existing buildings in middle of peninsula to change from other types of usage to touristic usage. However, the result of the $USAGE_{new}$ model is insignificant with a p-value higher than 0.05. This shows that touristic usage is not related to the construction of new buildings along riverbanks. The odds ratio value—1.01—implies that newly constructed buildings are used for touristic purposes regardless of their location.

Table 2. Estimation results of existing buildings that have changed to touristic usage ($n = 657$) and new touristic buildings constructed along riverbanks ($n = 88$).

Variable	Description	Coefficient	Odds Ratio
$USAGE_{existing}$	Existing buildings changed from other types of usage to touristic usage	0.84 ***	2.32
$USAGE_{new}$	New buildings used for touristic purposes	0.01	1.01

*** Statistically significant at 0.001 confidence level.

This model verified the observation that existing buildings in riverbank areas are changing to touristic usage more than those in the middle of the peninsula. This supported the finding that riverbanks are more lucrative and desirable for touristic businesses [16]. Although new touristic buildings have emerged throughout the peninsula, the number of existing buildings is much higher than the number of new buildings, and contributed to the increase of touristic usage along riverbanks. Two influential reports pointed out that the core heritage area is overwhelmed by touristic activities and touristic buildings have increased throughout the area [21,29]. However, touristic buildings increased mostly along riverbanks, contrary to the reports. The only other study on the built environment of Luang Prabang was conducted by Dearborn and Stallmeyer [17,18]. Their study used a small sample of 19 buildings in the core heritage area. Although their study revealed that most of the sampled buildings were renovated to meet the needs of tourism, the sample is insufficient to illustrate the case for all buildings in the core area. In comparison, this study has utilized the entire cohort in the analysis, and the spatial pattern is statistically significant. Therefore, this study is the first to contribute clear evidence that the increase of touristic usage in existing buildings is related to the riverbank location.

4.2. Relation between Increase of Touristic Usage and Significant Changes in the Built Environment

It is vital to find out whether an increase in touristic usage is related to three significant changes in the built environment. Table 3 shows the chi-square test of independence values for existing buildings and new buildings. The results of three variables ($ARCH_{existing}$, $MAT_{existing}$, and $ROOF_{existing}$) are statistically significant and reject the null hypothesis that change to touristic usage and the other three variables are independent. This indicates that, in existing buildings, change to touristic usage is related to all significant changes in architecture, building materials, and roof materials, respectively. Therefore, change to touristic usage has influenced the change from other types of architecture to Lao traditional architecture, change from traditional to modern materials, and change from modern to traditional roof materials. An example of such change is illustrated by a house located in Vatnong village, shown in Figure 5. The residential house changed into a guesthouse and was transformed from modern architecture to Lao traditional architecture. In the past, the house was of a mixed design imported from neighboring countries such as Thailand. An example of this type of modern architecture is depicted in Figure 6. The house's building materials changed from timber to modern materials, a combination of timber and cement. The roof materials changed from modern roof materials—corrugated zinc—to small traditional roof tiles.

Table 3. Chi-square test of independence values for existing buildings ($n = 657$) and new buildings ($n = 88$).

Variable	Description	Chi-Square (Observed Value)
Existing buildings		
ARCH _{existing}	Changed from other types of architecture to Lao traditional architecture	13.655 ***
MAT _{existing}	Changed from traditional to modern materials	12.864 ***
ROOF _{existing}	Changed from modern to traditional roof materials	69.566 ***
New buildings		
ARCH _{new}	Used Lao traditional architecture	3.302
MAT _{new}	Used modern building materials	0.108
ROOF _{new}	Used traditional roof materials	7.645 **

*** Statistically significant at 0.001, ** at 0.01.



Figure 5. An example of the change in architecture and roof materials that a residential house underwent upon changing to a guesthouse.



Figure 6. An example of modern architecture of mixed design, imported from neighboring countries, and use of modern roof materials.

However, for new buildings, only one variable ($ROOF_{new}$) is statistically significant, and two other variables ($ARCH_{new}$ and MAT_{new}) are insignificant. Unlike existing buildings, new touristic buildings are only related to the use of traditional roof materials. This means that constructions of new touristic buildings have influenced the use of traditional roof materials but not necessarily influenced the use of Lao traditional architecture or modern materials.

Existing studies have shown that tourism growth and urban development have led to an increase of modern buildings and a decline of traditional houses in other similar Asian HULs [5,7–12]. Construction of modern structures utilizes modern designs and materials. However, the case of Luang Prabang has shown an opposing change, unlike other historic cities in the region. Conversion to touristic use in existing buildings has prompted locals to change unflattering modern features to traditional features, such as Lao traditional architecture and traditional roof materials that accentuate the design of a Lao house. In the workshop conducted with local experts from DPL, they expressed that both architecture and roof materials were important building features that have a high impact on the overall landscape [16]. Although an increase of touristic usage has also led to an increase of modern materials, the local experts viewed it as an implication of following PSMV. This was because the PSMV allowed local residents to use any building materials as long as they were not visible and covered with natural color paint [39]. As such, use of modern materials is not perceived as negative change. Local experts also revealed that they have collaborated with the Department of Tourism to issue touristic business licenses, provided that the renovated or newly constructed buildings conformed to PSMV. This suggests the joint efforts have helped to ensure that locals comply with regulations and change their buildings in a manner that still preserves the heritage site. Overall, the increase of touristic usage has contributed to strengthening the heritage elements of the HUL. This finding differed with Boccardi and Logan's [19] claim that an increase of touristic accommodations such as hotels has resulted in the decrease of traditional houses. Hence, the empirical evidence presented helps to clarify the relation between the increase of touristic buildings and significant changes in the built environment in Luang Prabang.

5. Conclusions

Uncoordinated tourism growth and urban development have resulted in the negative transformation of HULs in Asian developing countries. Although sharp tourism growth is perceived to have undesirable implications, there is a lack of studies to address tourism impact in the Asian heritage context. This case study on Luang Prabang, Lao PDR, aimed at examining how the increase of touristic buildings has affected the landscape in terms of the spatial pattern of change and relation with significant changes in the built environment. GIS, combined with statistical approaches, has validated two aspects in the pilot site of six villages within the core heritage area. First, change from other types of usage to touristic usage in existing buildings has influenced the land use pattern, where conversion to touristic usage is more likely to occur along riverbanks than in the middle of the peninsula. Second, a change to touristic usage in existing buildings is related to significant changes in the built environment, such as change from other types of architecture to Lao architecture, change from traditional to modern materials, and change from modern to traditional roof materials. Hence, this study has contributed empirical evidence in establishing the impact that the increase of touristic usage has on the landscape of Luang Prabang. An increase of touristic buildings did not transform the built environment of Luang Prabang negatively, as presumed in existing literature and as observed in other similar historic cities. Instead, it has reinforced heritage elements of the HUL. It also has shown that sharp tourism growth in a heritage site may not necessarily have detrimental impacts on the built environment and a plausible balance can be achieved between development and preservation.

The study's findings have practical implications to local heritage management and policy-makers. They were able to better understand the dynamics between tourism growth and the changing landscape of the heritage site. In addition, they were able to visualize that current preservation policies were in fact functioning to balance development and preservation. The information derived from this study allows them to determine Luang Prabang's carrying capacity to accommodate development without compromising outstanding universal value (OUV). It also provided them the platform to facilitate the revision of urban policies and preservation regulations.

This study has some limitations. Although the positive findings are obtained from the analysis of a pilot site, it may not necessarily reflect the situation in the entire World Heritage Site. Moreover, the other areas in the heritage site may experience different changes. For example, an increase in density could be significantly higher outside the core heritage area, since there is more land available for development. More updated data are also required to investigate more recent trends of changes in relation to the increase of touristic buildings. The analysis is constrained by availability of data due to limited resources and manpower. Thus, the variables included in statistical methods are limited within available data. Future research can be expanded to incorporate more relevant variables such as social and economic aspects.

Acknowledgments: This research was funded by the Japan Society for the Promotion of Science (JSPS), Grant Number JP21404001, from 2009 to 2011. The authors greatly appreciate the close collaboration with the late Bounnhang Phongphichit, former Director of the DPL; Savuey Silavanh, current Director of the DPL; the Construction and Restoration Unit of the DPL; and the Information Communication and Technology (ICT) Unit of the DPL.

Author Contributions: Ceelia Leong designed the GIS application and performed the analysis of the pilot site of Luang Prabang. The analysis using statistical methods were guided under the supervision of Shinya Hanaoka. The entirety of this research was conducted under the supervision of Jun-chi Takada and Shinobu Yamaguchi.

Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations

The following abbreviations are used in this manuscript:

DPL	Luang Prabang Department of World Heritage Site (La Department du Patrimoine Luang Prabang)
GIS	Geographic information systems
HUL	Historic Urban Landscape
PSMV	Safeguarding and Preservation Plan (Plan de Sauvegard et de Mise en Valeur)

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