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Analyzing the Indigenous Adaptation in Urban Planning and Architecture of Selected Resort Cities in Vietnam

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Abstract

Indigenous adaptation refers to the process by which local communities integrate traditional knowledge, cultural practices, and ecological principles into contemporary systems to respond to social, environmental, and economic challenges. Globally, there are lots of resort cities which have done quite well with regard to indigenous adaptation in urban planning and architecture. In Vietnam, the French built a number of resort cities during their occupation. These resort cities, with their dual focus on tourism and local community well-being, provide a unique lens to study the interplay between tradition and modernity in urban design. However, these resort cities now face unique challenges due to the interplay of tourism, urban development, and environmental sustainability.

Learning lesson collected from selected cases of resort cities in the world, this paper presents the technique to analyze and evaluate the indigenous adaptive level with regard to urban planning and architecture. The technique is accompanied by a set of established criteria (elements) which have been withdrawn from international experience. The technique is then demonstrated with selected resort cities in Vietnam including Tam Dao, Bach Ma, Ba Vi, Sa Pa, Da Lat. Further study can explore more thoroughly the applicability of the technique to other indigenous adaptation situations.

1. Introduction

The section headings are arranged by numbers, bold and 10.0 pt. Here follows further instructions for authors. Indigenous adaptation refers to the process by which local communities integrate traditional knowledge, cultural practices, and ecological principles into contemporary systems to respond to social, environmental, and economic challenges [1, 2]. Rooted in generations of accumulated experience, these adaptations often reflect a deep understanding of local environments and resources, offering sustainable solutions that align with community values and cultural identities [1]. In the context of urban planning and architecture, indigenous adaptation emphasizes the preservation of cultural heritage while meeting modern urban demands. This approach is particularly critical in regions undergoing rapid development, where globalization often risks homogenizing local identities. By incorporating indigenous knowledge into design and planning, communities can maintain cultural distinctiveness, promote ecological balance, and enhance resilience to environmental challenges, such as climate change [3, 4].

Indigenous resort cities blend local cultural heritage and traditional practices with modern tourism to create unique and sustainable travel destinations [5]. These cities harness indigenous knowledge to promote environmental stewardship, cultural preservation, and community well-being. The approach has been proved with lots of significant advantages, including sustainability and resource management [1], cultural integration [6], eco-friendly design [7], biodiversity and conservation, community empowerment [8] and climate resilience [3, 9].

In Vietnam, the French started to develop resort cities since 1904. The reason was that after the occupation of Indochina, the French military wanted to reduce the number of troops, retaining only a few garrisons in the cities because the tropical climate had depleted their health and forced them to send some troops to recuperate in places with climatic conditions such as in their own country. Lots of resort cities all over the countries have been built in the French Colonial Period, namely Da Lat, Tam Dao, Sa Pa, Ba Vi, Ba Na, Bach Ma etc. [10]. Resort cities, with their dual focus on tourism and local community well-being, provide a unique lens to study the interplay between tradition and modernity in urban design. However, these resort cities now face unique challenges due to the interplay of tourism, urban development, and environmental sustainability.

In fact, "Adaptive conservation" is a practice that is no longer strange in many heritage neighborhoods around the world, and urban heritage during the French colonial era in Vietnam is no exception [2]. Cities that incorporate indigenous elements possess ecological significance and a unique national and cultural identity. Urban planning and architecture are shaped by both positive and negative influences stemming from these indigenous factors. The extent to which local elements—such as culture, society, economy, and environment—impact planning and architecture reflects how well a city adapts to its indigenous characteristics. Urban planning and architectural activities also represent human influence on environmental factors and natural landscapes.

In order to effectively protect and promote the values of this heritage group, the selection of adaptive conservation methods is an appropriate direction in the context of urban development in Vietnam. There is a gap on a method to analyze the indigenous adaptation of resort cities due to the lack of a system of indigenous adaptive criteria.

This study, aiming to address this gap, tries to use international experience collected from highly indigenous adaptive resort cities to establish a technique to analyze, measure the adaptation level of resort cities in Vietnam which were built in the French colonial era. The technique can be used to analyze the current status of resort cities with regard to indigenous adaptation in urban planning and architecture, which facilitate informed decision on development and reservation of those cities.

2. Background

2.1 Theories of Indigenous Architecture and Planning

Indigenous architecture is a concept that has been in use for a long time and an important proof of design that properly considers environmental conditions and the context of the location.

In history, it is possible to note that some features of this issue came out very early, which developed throughout the modern era of architecture and have become a mainstream today. Architect Bernard Rudofsky (1964) provided evidence of the diversity and abundance of local architecture built by people in his exhibition entitled "Architecture without architects" [11]; Architect Frey Pierre (2010) emphasized the value of indigenous elements in architecture [12], or architect Rubenilson Brazão Teixeira (2017) pointed out two main attributes related to indigenous architecture: tradition and cultural context [13]. He claimed that indigenous architecture is traditional and originates from specific ethnic groups and it is the result of a long process over time, always based on the continuation of the past experiences [13]. In addition, indigenous architecture also respects local conditions, harmonizing with the geographical context of the surrounding environment, including climate, vegetation and topography [14]. Therefore, it can be understood that indigenous architecture is built by people, subject to the local environment in a specific context. The design of indigenous architecture depends on various factors, such as availability of resources, cultural elements, construction techniques and the living environment of a specific area at a particular time. Indigenous architecture is a kind of “testament” to human ingenuity in building their homes by means of different methods and techniques to adapt to the environment as best as possible.

2.2 Theory of Sustainable Development

Sustainable urbanism includes elements of sustainable development that enable cities to maintain their long-term development, meeting current needs without jeopardizing future needs. Sustainable cities must also be energy-efficient and economical [15]. In fact, the following three factors - economy, society and environment (biotic and abiotic) - need to be used flexibly and harmoniously to determine sustainable development (Figure 1) [16]. Depending on each historical period and geographical context, the level of use of these three elements may vary.

Sustainable architecture is the optimal level of the sustainable design philosophy, as demonstrated throughout the design methodology, design solutions and decisions to be made in the construction, operation and use, as well as the reuse when the building has reached its full life cycle [17]. In order to ensure sustainability,

architecture has to fulfill the criteria of location, use of energy resources, quality of the built environment, identity in architecture and social sustainability. These factors can be interpreted as indigenous adaptation and indigenous adaptive architecture should be sustainable architecture [7]. From this perspective, it is apparent that sustainable development is a must for development in the new era.

Fig. 1 *Elements of sustainable development in the 21st century include three main elements: Economy, Society and Environment (Source: [16])*

2.3 Selected Relevant Concepts on Indigenous Elements of Urban Planning And Architecture

Indigenous/Indigeneity: the adjective "Indigenous" (noun form: "Indigeneity") means "belonging to land". The word "indigenous" in Latin also means home, nature and native.

Indigenous adaptation: Over time, new imprints will emerge within that community to adapt to the "native" environment, exemplifying indigenous adaptation, thereby altering previously recognized forms to align with the local context.

Indigenous architecture: Can be perceived as an architectural work rooted in the inherent attributes and conventional materials of the region, an architectural style that emerges from the locality itself. Indigenous architecture employs native construction methods and practices, resulting in distinctive architectural styles characteristic of the specific locality. Indigenous architecture is inherently traditional and may also encompass elements of vernacular architecture, as local development occurs concurrently. In the context of this research study, "Indigenous architecture" can be regarded to as the traditional architecture of the Vietnamese people, namely the architectural style utilized by the local community, as defined in the dictionary [7]. The movement of maintaining and promoting indigenous architecture aims to rejuvenate traditional cultural elements and national identities, thereby enhancing the architectural diversity among countries, ethnic groups, and regions [7].

Indigenous culture: the totality of material and spiritual values of a community, locality, region or region created in the historical process. The characteristic of the local culture is the cultural identity of that locality [6].

3. Literature Review on Indigenous Adaptation of Urban Planning and Architecture

Indigenous adaptation in urban planning and architecture integrates traditional knowledge, cultural values, and ecological sensitivity into modern design and city development. The literature highlights the significance of leveraging indigenous practices to promote sustainability, resilience, and cultural identity. According to A. Rappaport in his work entitled "House Form and Culture" being published in 1969, "the natural environment gives us many possibilities to choose from and people decide to choose the one that best suits their cultural background" [18]. Therefore, local adaptation in planning and architecture is the formation of new marks in planning and architecture through the process of understanding nature, cultural characteristics and applying local techniques and experiences combined with intervention methods. Those activities need to respect the natural conditions, terrain and rely on the cultural background of the community in that area [18].

Research underscores the value of indigenous knowledge systems in fostering environmentally conscious urban development. Traditional practices often prioritize harmony with nature, efficient resource use, and long-term sustainability. Berkes [19] emphasizes the role of traditional ecological knowledge in addressing modern

urban challenges such as climate change and biodiversity loss. The relevant case study is the "Subak" irrigation system in Bali illustrates how indigenous water management techniques can inform sustainable urban planning. Pearce, et al. [9] highlight how Arctic communities incorporate indigenous practices to address climate variability in urban designs for resilience and climate adaptation. In coastal cities, indigenous approaches such as mangrove conservation and stilt architecture have been adopted to mitigate flooding and sea-level rise. Indigenous adaptation strategies often align with climate-resilient urban planning by focusing on local environmental conditions and risks. With regard to culturally responsive architecture, Oliver [20] outlines how traditional building techniques adapt to diverse ecological contexts. Indigenous architecture emphasizes the use of local materials, climate-sensitive designs, and cultural symbolism, which align with sustainable building practices. A modern case for illustration is the use of adobe and stone in Andean communities has inspired energy-efficient housing designs in arid regions globally. Recent studies also advocate for integrating indigenous urban planning principles into contemporary cities to address issues of equity, inclusion, and sustainability. Porter [21] examines how indigenous spatial governance can redefine urban planning processes in settler-colonial societies. A real case includes the revitalization of Māori cultural landscapes in Auckland, which demonstrates how indigenous practices can coexist with urban growth.

Information extracted from the international experience and lessons learnt will provide references for developing a technique to analyse the real practice of indigenous adaptation status of resort cities developed in the French-era period in Vietnam.

4. Research Methodology

Aiming to analyze the indigenous adaptation in urban planning and architecture of selected resort cities in Vietnam, this research study applied a 4-stage process (Figure 2). Firstly, three overseas cities which are considered as highly indigenous adaptive were selected. Secondly, exploratory research was implemented to determine the significant indigenous adaptation criteria (elements) of those cities. Thirdly, an analysis technique was developed to use the criteria to measure the level of indigenous adaptation of cities. Lastly, several resort cities in Vietnam developed during the French colonial period was selected and assessed to demonstrate the use of and validate the proposed technique.

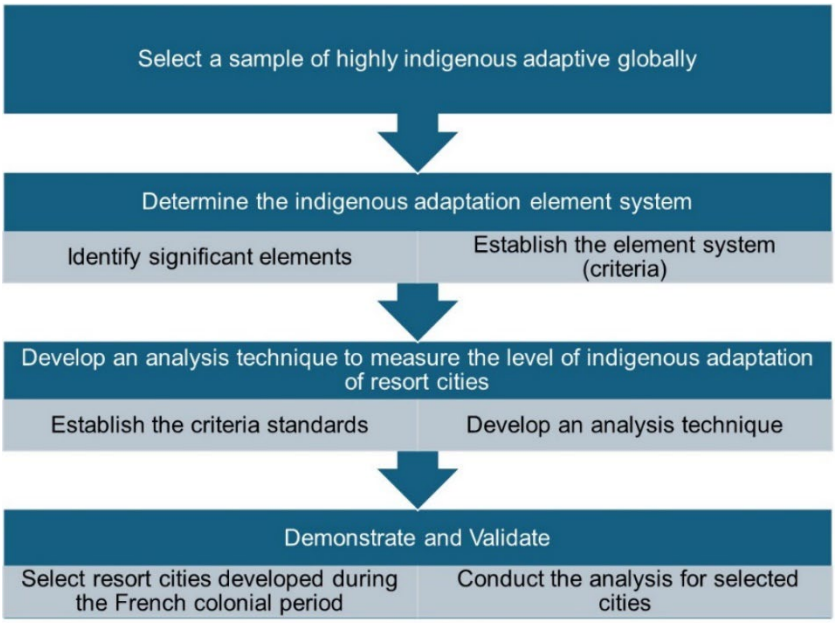

Fig. 2 *The research process*

Local and international relevant artifacts have been collected as sources for the research study. Mapping was used for cross-reference with historical documents to identify and evaluate the objective transformation process of urban structures and architectural works through development stages. Survey was conducted with measurements and photos taken to investigate the current status of planning and architecture of selected resort cities in Vietnam, which were built during the French colonial period and were built and planned with Western experiences. Drawings, images and diagrams have been created/developed to facilitate research study.

5. Research Results

5.1 Determine the Significant Indigenous Adaptation Elements from International Experience

This section looks into the indigenous adaptation elements globally by exploring the cases of three cities: Grindelwald (Switzerland), Aspen (Colorado, USA) and Grenoble (France).

5.1.1 Grindelwald, Switzerland

Grindelwald (Figure 3), located in Interlaken-Oberhasli, Bern, Switzerland, is renowned as the first and oldest resort town in both Switzerland and Europe. Spanning an area of 171.33 km^2, the land use is diverse: 28.9% is dedicated to agriculture, 16.4% is forested, 1.8% accommodates civil engineering and transportation infrastructure, 0.8% consists of rivers and lakes, and 52.1% is classified as non-productive land. Tourism in Grindelwald began in the late 18th and early 19th centuries, driven primarily by British settlers, and it remains the cornerstone of the local economy today [22, 23].

Recognizing the importance of sustainable development, Grindelwald has embraced a strategy that integrates robust agricultural practices as a natural safeguard and adaptive urban planning to harmonize with tourism. This approach has cemented Grindelwald's reputation as one of Switzerland's premier tourist destinations [22, 23]. Selected characteristics of the city include [22, 23]:

- Use public transport: tram, private car, bus, tram.
- Limit environmental pollution, clean air, sustainable green places
- The quality of clean drinking water is almost crystalline.
- Organize planning of many parks, squares and green spaces
- Require new hotel architecture with a combination of traditional architecture
- Provide good social service.

Fig. 3 *The tourist town of Grindelwal-Switzerland (Source: [24])*

5.1.2 Aspen, Colorado, USA

Aspen (Figure 4) is a popular tourist destination and is the most populous city in Pitkin County, Colorado, USA with a population of 6,658 people. At an altitude of about 2,400m above sea level, Aspen city has a total area of 9.1 km^2, with humid continental climate and ethnic minorities, mainly Spaniards. At the end of the 20th century, Aspen was a tourist resort town famous for its cultural centers and was known as the home of the Aspen music festival [25].

Aspen has a diverse, historic ethnic community, a dynamic economy and a unique natural scene. Each of these factors contributes to the attractiveness and enhancement of the city's living value. Therefore, the policy of preserving historical sites has been identified as a resource and should be prioritized. This policy is articulated

clearly in the Aspen area community plan and in the ordinances protecting assets in the identified historic areas. In 1999, the city council passed a resolution that included [25]:

- Immigration restrictions due to concerns about the environmental impact on the community.
- An energy-free city, using 100% renewable energy.
- Relying on natural factors for sustainable economic development.

Fig. 4 *Aspen-Colorado-USA Tourist City (Source: [25])*

5.1.3 Town of Grenoble, France

Located at the foot of the Alps in Southeastern France, the Grenoble Alpes Métropole consists of 28 autonomous regions and 405,000 inhabitants. Covering an area of 18.13 km^2, Grenoble is a bustling yet tranquil city of nature that is the cultural, artistic, business and research center of the region [26].

Grenoble (Figure 5) and its surrounding areas are both heavy industrial and mining areas, making Grenoble eco-conscious and the most eco-city in the western hemisphere. Yves Exbrayat, director of Grenoble's tourism office, said that the city of Grenoble has paid close attention to ecological and pollution problems, which are not only a matter of technology, but also an "art of living". With the aim of having sustainable urban development, indigenous adaptation to current conditions, Grenoble has created eco-friendly residential areas, has built bioclimatic schools, and has developed urban agriculture projects. For more than a decade, the city has created a more energy efficient and environmentally friendly community [26].

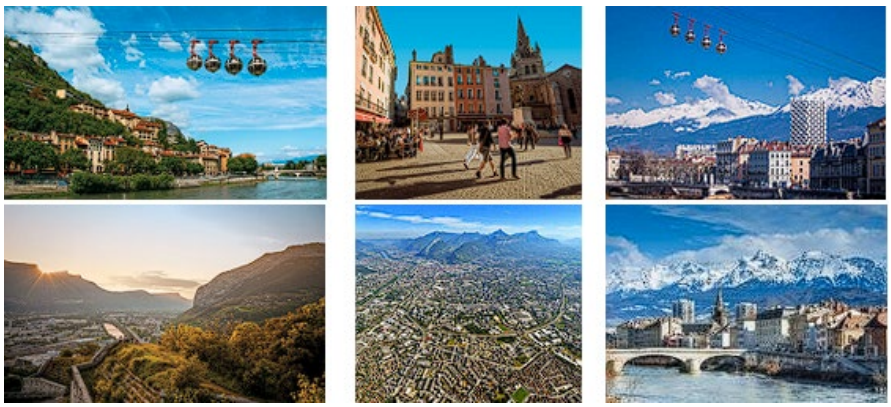

Fig. 5 *The tourist town of Grenoble-France (Source: [26])*

5.2 Determine the Indigenous Adaptation Element System with Regard to Urban Architecture and Planning

From the theories of indigenous architecture, the theory of sustainable development, combined with the experiences of indigenous adaptive urban development of some cities considered successful in sustainable

development in the world mentioned above, we have summarized the factors considered indigenous adaptation, expressed through three characteristics towards sustainable development:

(1) Indigenous natural conditions (ENVIROMENT), which describe:

- Local Weather and Climate Adaptive Design
- Building Plans That Respect the Natural Topography
- Building Plans That Respect the Natural Ecosystem of the Area

(2) Indigenous economic and technical conditions (ECONOMY), which look into:

- Urban development in line with local economy
- Developing local potentials
- Designing flexibly using local materials and indigenous technology

(3) Indigenous cultural and social conditions (SOCIETY), which concern:

- Architecture needs to maximize the value of local cultural identity
- Architecture respects and promotes indigenous religious values
- Urban design towards indigenous communities

In order to evaluate the Planning and Architecture of an indigenously adapted urban area, it is necessary to consider the architectural and planning elements that are directly affected by indigenous elements, and to place the architectural elements in a reciprocal relationship with the indigenous. From that, Planning specifically refers to the urban landscape elements and the technical infrastructure network system. Architecture is divided into 3 main categories, including type (TYPE), shape (FORM) and Technique (TECHNIQUE), as follows:

- **TYPE:** Includes architectural function and form. Sa Pa is a tourist city, so it is necessary to clearly identify which function is more focused on. The form of the building is the surface that directly affects the urban area and the emotions of the subject, creating the spiritual characteristics of the urban area.
- **FORM:** includes elements of scale, color, and accents, which create impressive and emotional images and are physical characteristics of the city.
- **TECHNIQUE:** includes structural elements, details, and materials. These are elements that help revive indigenous techniques, shaping new functions and forms with distinctive cultural identities.

Figure 6 shows a holistic view of the urban planning and architecture with regard to indigenous adaptation. It demonstrates the relationship between indigenous elements (including indigenous environment, indigenous economy, and indigenous socio-culture) and key architectural and planning elements affected by indigenous elements, such as urban landscape, engineering, urban structure (planning) and function, shape, proportion, color, highlights, structure, details, materials of the building (architecture. Determining the interrelationship between indigenous elements and elements in planning and architecture will show them the degree of indigenous adaptation of the city.

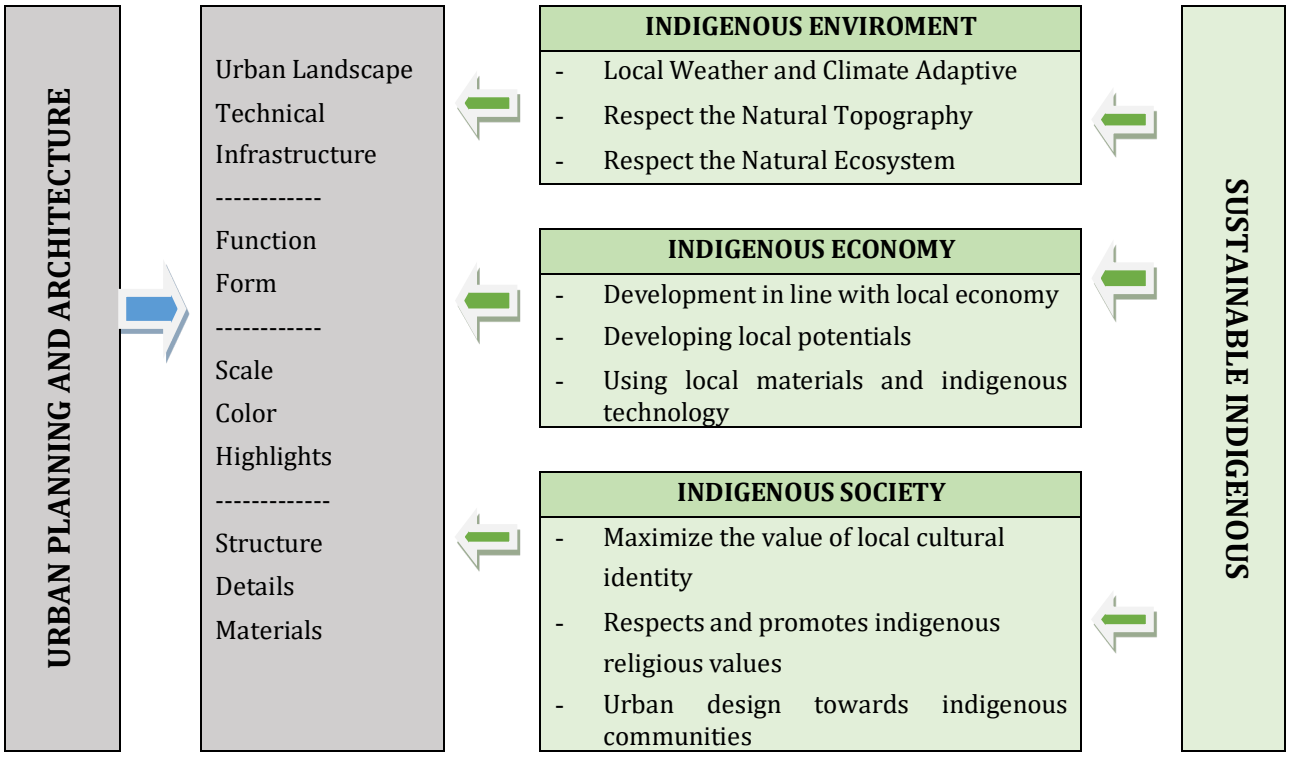

Fig. 6 *The correlation between urban planning and architecture and indigenous elements*

5.3 Technique for Analyzing the Level of Indigenous Adaptation with Regard to Urban Planning and Architecture

A technique is developed to reflect the criteria in analysing the indigenous adaptation with regard to urban planning and architecture of resort cities. This technique used the Likert scale of five levels to determine the importance of each criterion through a sociological survey table. The levels include fully adaptable, relatively adaptable, partial adaptation, not adaptable and completely unsuitable (Table 1).

Table 1 *Likert scale point*

Level	Range
Fully adaptable	80 - 100 Point
Relatively adaptable	60 - 80 point
Partial adaptation	40 - 60 point
Not adaptable	20 - 40 point
Completely unsuitable	0 – 20 point

Research sample: In order to objectively assess the importance of local factors, the researcher conducted a survey of 200 participants including architects, urban managers and representatives of tourism companies. The research subjects were selected to participate in the study using the convenience sampling method. General information on the sample is shown in Table 2.

Table 2 *Participants in the assessment of indigenous adaptation levels*

Types of Participants	Symbol	Quantity (pers)	Percentage %
Architect	D.KTS	140	65.00
Urban management	D.QL	20	10.00
Travel agency	D.DL	40	25.00
Total	D.KTS	140	65.00

Method of scale evaluation: Before analyzing the survey results, the researcher evaluated the Likert scale used using the Chronbach's alpha reliability coefficient with the criterion that the questionnaire has good reliability if the Chronbach's alpha reliability coefficient is greater than or equal to 0.6. The results of the group of questions on natural conditions, the group of questions on socio-culture and the group of questions on technical economics have chronbach's alpha values of 0.81; 0.78 and 0.77 respectively. This result shows that the technique is reliable.

6. Demonstration and Validation with Selected Resort Cities in Vietnam with Regard to Indigenous Adaptability in Urban Planning and Architecture

6.1 Select Resort Cities Which Were Developed in the French Colonial Era to Analyze

6.1.1 The Resort Cities Developed in the French Colonial Era in Vietnam

After the occupation of Indochina, the French had a need for holiday resorts in places which had the same climate conditions as in their own country. So in 1904, the French government directed the research and establishment of resorts in the beach and highland areas. But before that, in 1897, Doctor Alexandre Yersin suggested to Governor General of Indochina Paul Doumer to choose Lam Vien plateau as the ideal land for the French to relax in the Central region. Since then, Da Lat city began to be built in the European architectural style. In 1905, different activities of exploration, research, selection and construction of highland resorts such as Sa Pa, Tam Dao, Ba Vi in the North and the highlands of Da Lat and Ba Na in the Central region (Annam) took place [23, 27, 28]. Table 3 summarizes the brief information on such cities.

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Table 3 *The emergence of French resort cities in Vietnam*

Region	Resort Cities	Time Built
Northern Vietnam	Sa Pa	1909
	Tam Dao	1904
	Ba Vi	1942-1943
	Sam Son	1905-1906
	Do Son	1900
Central Vietnam	Da Lat	1897
	Ba Na	1911
	Bach Ma	1932
Southern Vietnam	Vung Tau	1895-1900

Since 1940, due to the world situation, the length of French stay in Indochina was extended Indochina. The need to rest and recuperate, seeking a suitable upland climate increased. Da Lat, Sa Pa, Tam Dao were studied for further development, and at the same time, research on new resorts such as Ba Vi with an altitude of 1,000m was conducted.

6.1.2 Ba Vi

Since Bavi is located 70km away from the center of Hanoi, with cool climate all year round, the French chose Ba Vi mountain to build a resort. In the early 20th century, Ba Vi was developed from a small town into a tourist town with many villas, farms, plantations and even military bases, of which planning and construction focused on local factors according to their needs at that time (Table 4). This was confirmed in the book "Architecture et métissages dans le Vietnam colonial" [29]. In 1943, in the first planning phase, Ba Vi was oriented planning according to high core terrain [10, 29]. At the elevation 400 (400m altitude) landscape would be pine forest, grass, up to elevation 600 was the mountainside area, which was planned to build villas, hotels, kindergartens, underground mansions. At an altitude of about 800m would include a church, dispensary, resort villas, an orphanage together with the idea of building a prison and a heliport at the base of 1,000m.

In the period from 1945-1970 in war conditions and post-war recovery, Ba Vi's planning and architecture did not achieve significant results. During the Renovation period, Ba Vi Forbidden Forest was established in 1977 and was transformed into a National Park (1991). Up to now, Ba Vi National Park has become a biodiversity conservation site and a destination for many tourists and many visitors (Figure 7).

Table 4 *The process of formation and development of Ba Vi resort in the French period*

THE PROCESS OF FORMATION AND DEVELOPMENT OF BAVI URBAN AREA				
1914	**1923 - 1929**	**1937**	**1942**	**1945**
First construction (plantation, summer camp, livestock area)	Expanded construction mansion villas, Embassy,	Continue to expand: Hotels, villas...	First planning: Square, shops, church, clinic	Continued expansion: Orphanage, prison, airport

Fig. 7 *Pictures of Ba Vi resort in French time and nowadays (Source: Melia Project)*

6.1.3 Tam Dao

Around 1912, in Tam Dao, there were almost only houses for main guards, one or two motels and bunkers. But after a while, with an increasing number of tourists and resort guests, the planning and architecture during this period gave birth to fully-equipped hotels. An urban area including hotels, private villas, companies, sanatoriums, new green loincloths... was researched and built to suit the natural elements, topography as well as climate of the area (Table 5). The works in Tam Dao were the mark of the transition period between traditional architecture and modern architecture in Vietnam. Constructions which were a combination of European technology and art creatively applied in the tropics were built using mainly locally quarried stone materials.

Table 5 *The process of formation and development of Tam Dao urban area in the French period*

THE PROCESS OF FORMATION AND DEVELOPMENT OF TAM DAO URBAN AREA				
1904	**1906**	**1914**	**1942**	**1945**
Was found out by French people.	Starting constructions - Cable traction railway	Urban expansion with hotels, villas	Western Development Tam Dao 2 Traffic expansion	Complete planning and engineering - Nearly 150 villas

The villas were planned to be built separately along the mountainside, not overlapping in design, while the higher-rise buildings were planned to be built far from the centre. The villas in Tam Dao were solid, large-scale with romantic names such as L'Horizon (skyline), Belle Vue (spectacular)... Most of the villas had walls built with 60-120 cm thick stone. Some were built with bricks, with thin stone roofs imported from France. The interior has a fireplace, swimming pool, ballroom, wine cellar… With stairs, stone walls of the Governor General's Palace elaborately and delicately built or the food cellar of Metropolle hotel, villas, Belle Vue has shown a remarkable evolution of French architecture [10, 30].

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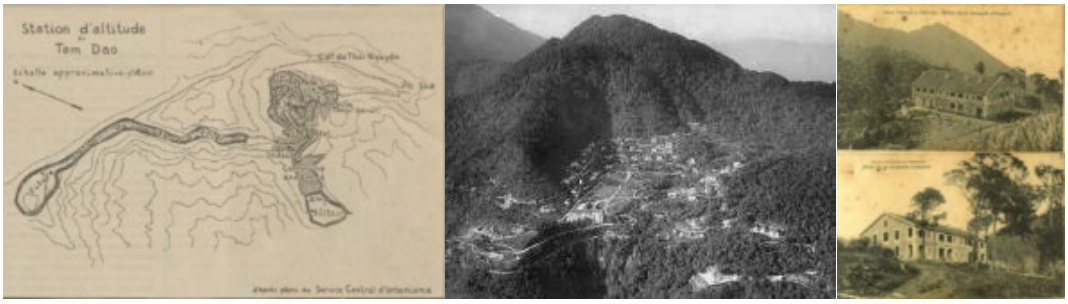

Fig. 8 *Pictures of Tam Dao resort during the French colonial period (Source: [10])*

After the war, due to the splitting of provinces and joining the provinces, construction management was not focused. Therefore, in the 2000s, the image of a famous resort town in the French colonial period was lost as a result of the massive construction development which disrupted many natural landscapes. There are few traces of French architecture left which is difficult to restore, but the value of the place remains unchanged because Tam Dao is located near the capital city of Hanoi and is surrounded by primeval forest with cool climate, and unique terrain.

Fig. 9 *Overview of Tam Dao today (Source: [31])*

6.1.4 Bach Ma

Bach Ma Mountain is located about 40 km south of Hue city, about 70 km north of Da Nang, in the territory of Thua Thien Hue province. Located at the end of the North Truong Son mountain range extending from the Vietnam-Laos border to the East Sea, with an altitude of 1,450m above sea level, Bach Ma mountain has a cool climate all year round which was evaluated by the French as a place with great potential for resort tourism.

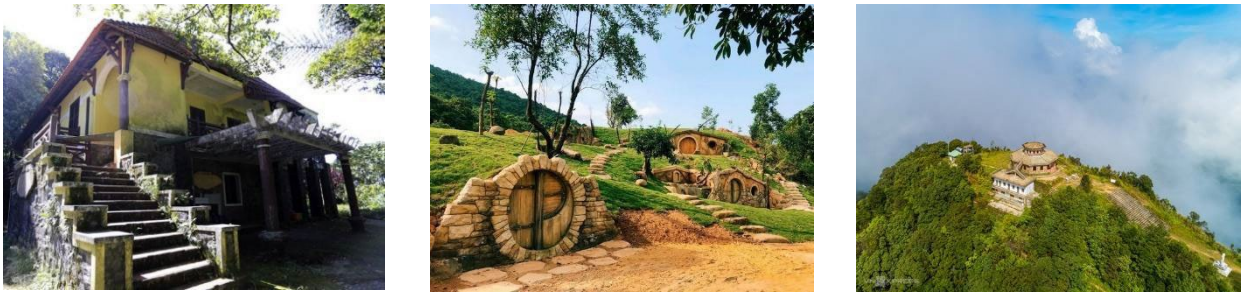

Fig. 10 *Panorama of Bach Ma during the French colonial period (Source: [10])*

So, right after discovering Bach Ma, in 1932 the French made a detailed plan to build this place into an elevated resort with an area of about 300 hectares, including high quality resort villas, and areas dedicated to afforestation and nature conservation. Bach Ma has 3 peaks over 1,400 meters high, all of which were built on it, including: a peak of 1,450 meters high with the Redemptorist Order near the post office and bus station; a peak with Vong Canh hill at 1,450 meters high, a place to stay and admire the scenery called Vong Hai Dai. In addition, a peak of 1,375 meters high with the Embassy of Thua Thien Hue province was also built. The French divided plots of planned land to build houses and organize auctions. In 1936, 17 more wooden motels and villas were built. In 1938, the motorway was made to the top, more motels and villas continued to be built. And by the end of 1940, the total number of motels reached 130, including 2 hotels Morin and Bany with 15 beds. Therefore, from 1936 to 1945, in Bach Ma, a large resort was established with nearly 200 houses and villas built by organizations and private individuals [10].

In 1991, Bach Ma-Hai Van forbidden forest was renamed Bach Ma National Park with an area of more than 22,000 hectares. In 2008, Bach Ma National Park was adjusted and expanded to nearly 37,500 hectares, planned to preserve the unique ecosystem of the region.

6.1.5 Sa Pa

Before 1890: The land of Sa Pa was once an ancient land. The indigenous community consisted of ethnic Minorities living scattered on the slopes and dangerous high mountains. Life was mainly based on hunting, gathering, and vertical farming. Therefore, houses were built according to appropriate production methods and lifestyles, houses on stilts and ground-floor houses suitable to the culture and production methods of each ethnic group [32].

Map of Sa Pa in 1890

Ethnic people

Fig. 11 *Sa Pa before the French colonial period*

Period from 1909-1945: Since 1897, the French had researched on the ethnicity and language of ethnic minorities living scattered in the mountains of Sa Pa in order to have a basis for developing resorts for the French army. In June 1905, the Indochina Cadastral Department had a detailed topographical map of Sa Pa area with the scale of 1/10,000 with surveys on climatic conditions to build a tourist town.

The first planning of Sapa with European city style was both a resort and a temperate agricultural development. Sa Pa was formed according to the principle of functional zoning planning, dividing each area and depending on the function used to specialize in urban space. The urban planning of Sa Pa was to harmonize the lives between Westerners and indigenous people, the common life between civilians and the military officers

The 1922 planning map clearly oriented each type of constructions, their function and scale in accordance with the topography of each area and the correct implementation of the regulations. The planning of the road

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network in this period was concentrated in the central area, the Sa Pa basin, not yet in the surrounding villages. The traffic system was closely linked with contoured lines, adding a highlight to the area's characteristics. There was clear urban planning with high land area for construction of large-scale works. Lowland areas were for construction of small-scale constructions. The most beautiful places overlooking the Muong Hoa valley and the top of Mount Fansipan were planned to build villas [10].

The construction works all took advantage of the natural terrain, without disturbing the natural landscape because it had been carefully calculated and studied in terms of density and clearly divided into functions. Western-style architecture, cement or stone, plastic, pavement, sidewalks were newly built.

Fig. 12 *Summary of the remaining French architectural works in Sa Pa*

Period 1945-1975: Due to the war, most of the French constructions were destroyed, but in general the architecture of this period did not leave any mark.

Period 1979-1986: Redevelopment began after the war, from expanding traffic routes, reclaiming new villages, rebuilding schools and hospitals, and at the same time reusing the facilities left by the French. The urban architecture of Sapa in this period has no significant mark...

Fig. 13 *Sa Pa in the pre-renovation period*

Period 1986-2000: Sa Pa re-established the province after the aftermath of the war, encouraging socialist-oriented multi-sector economic development. Tourism started to bloom. Since then, construction activities took place strongly. The starting point of this development phase was during the period of 1995 - 1997 in order to meet the tourism demand without any development planning orientation. Many types of constructions were built massively, and the vacant land gardens were divided into plots for construction. It is because of this development that the urban face of Sa Pa has changed rapidly, the image of a mountainous city is no longer there, but instead is the image of a plain city with many high-rise buildings and industrial parks. overwhelming the surrounding landscape.

Fig. 14 *Sapa in the years 1990-2000 (Source: [33])*

The first planning map after liberation in 1995 was clearly oriented planning for Sa Pa urban area, but so far, the rate of detailed planning has only reached more than 30% [34]. The architecture of this period also followed the socialist path of the big cities. But Sa Pa is a new area, with the difficulties of a mountainous province, with low education level and outdated customs, poor infrastructure, and the economy is still facing many difficulties, so the planning and economy have not been taken care of. Human and social disadvantages, rapid economic growth without sustainable development due to the general application of the same development model as urban areas in the delta. Moreover, the migration of indigenous people has weakened the sustainable connection of the inherent cultural and social characteristics of the mountainous area.

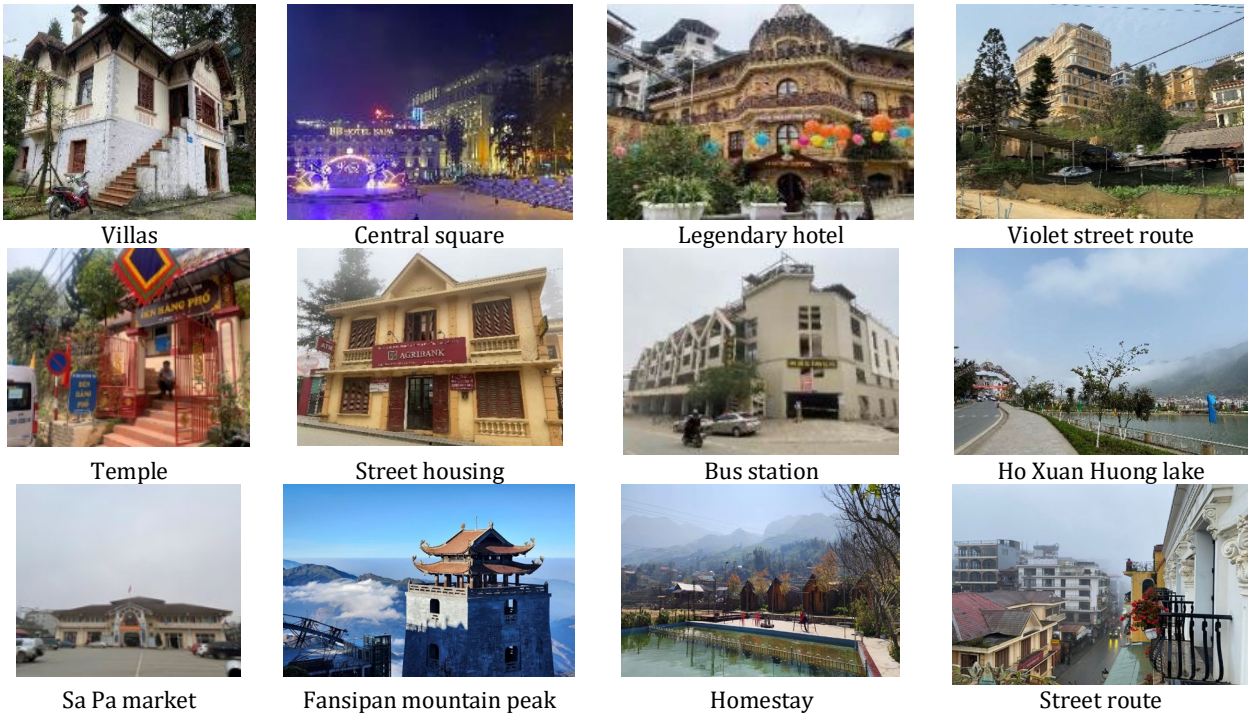

Fig. 15 *Some types of current architectural works of Sapa*

Period 2000-2020: This is the period of industrialization and modernization with rapid economic growth, and rapid population growth. Service tourism continues to be affirmed as a spearhead economy sector. The face of Sa Pa urban area changes rapidly [35] due to uncontrolled development [36].

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6.1.6 Da Lat

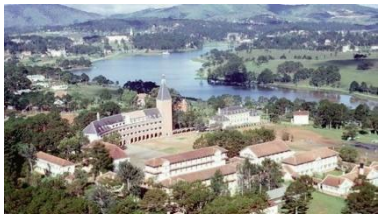
Da Lat was established in 1893 when Doctor Alexandre Yersin looked for a place to build a resort town on Lam Vien plateau, in central Vietnam. In the system of mountain resort towns planned by the French, Da Lat is a typical city that needs to be studied and learned from experience. It has been built according to European architectural style. The planning follows the natural topography, taking advantage of the elevation difference of the terrain to design, traffic organization and build buildings/ houses interspersed in different contour lines.

Table 6 *The process of formation and development of Da Lat*

THE PROCESS OF FORMULATION AND DEVELOPMENT OF DA LAT				
1893	**1899**	**1900-1914**	**1915-1939**	**1940-1954**
Alexandre Yersin discovered Lam Vien Plateau	Project Deployment Survey Zoning	The town of Da Lat Zoning Villas, schools, offices	Expanded development of this beautiful city Villas, Offices Hotels	Big city Education Center City tourism


Hotel Palace


Hotel Palace at present


Yersin School


European style architecture

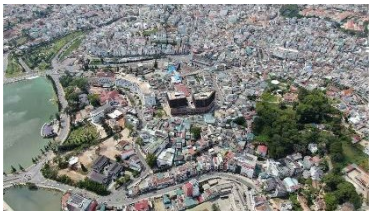


Fig. 16 *The process of formation and development of Da Lat for local adaptation (Source: Authors collected)*

The unique feature is the harmonious combination between the building and the natural landscape of the Lang Biang plateau. (The master planning project was designed by architect E. Hebrard in 1923). The French ecological urban model that had been applied in Da Lat is an example of how to show respect to topographical features and natural landscapes in design and construction. The outstanding features of the terrain and vegetation have been exploited and incorporated into the planning and architecture to emphasize the characteristics of the mountainous ecological urban area. The harmonious combination of natural ecological factors with human ecology in urban construction, ensuring the city's continuous development in the balance between different impact factors. Up to now, Da Lat has undergone 4 development periods: before 1945, the period between 1945-1954, the period of 1954-1975 and the period after 1975 [37, 38].

- During the period from 1945 to 1954, Da Lat was only a tourist city, no longer holding the function of "Summer Capital" as in the previous period.
- Since 1964, Da Lat suffered from many fluctuations and was no longer developed as in the previous period.
- After 1975, like many other cities in the early post-war period, Da Lat entered a difficult period. But since the late 1980s, along with the development of the country's economy, the renovation period of Da Lat tourist city also gradually revived, its urban infrastructure has continued to be built and upgraded. The area of Da Lat continues to expand, many new buildings have been added with increasingly modern architecture.

In the 2000s, Da Lat's urban infrastructure continued to be perfected. Many hospitals and schools were built. In 2009, Da Lat was recognized as a level I city, but the beautiful inheritance landscape of Da Lat has been lost due to the population explosion and urbanization. The special urban model of this city has been deformed. Da Lat is no longer green... Many architectural heritages of the city have been damaged and the landscape has been degraded by human impact.

6.2 Using the Proposed Technique to Analyze the Selected Cities in Vietnam with Regard to Indigenous Adaptation in Planning and Architecture

To evaluate objectively, the research team selected typical architectural works of a city for evaluation. The evaluation form scores each survey object based on the average coefficient according to the formula:

$$DTB= D.KTS * 0.65 + D.QL*0.1 + D.DL*0.25$$

Table 7 *Assessment of the level of adaptation of Sa Pa urban planning and architecture to indigenous elements*

The degree of indigenous adaptation of urban planning and architectural elements			INDIGENOUS ENVIROMENT			INDIGENOUS ECONOMY			INDIGENOUS SOCIETY			AVERAGE SCORE
			Local Weather and Climate Adaptive	Respect the Natural Topography	Respect the Natural Ecosystem	Development in line with local economy	Developing local potentials	Using local materials and indigenous technology	Value of local cultural identity	Indigenous religious values	Urban design towards indigenous communities	
Planning -		Landscape organization	42	45	48	38	45	41	44	41	36	42.2
Urban Landscape		Technical infrastructure network	40	38	32	37	42	58	48	53	53	44.6
Architecture	Type	Function	40	52	48	38	43	35	30	38	36	40.0
		Form	32	34	47	38	32	41	37	35	36	36.9
	Form	Scale	32	35	41	32	35	37	46	32	36	36.2
		Color	41	35	43	39	31	44	42	37	31	38.1
		Highlights	36	37	38	45	46	32	41	37	46	39.8
	Technique	Structure	32	42	52	53	35	41	45	35	44	38.2
		Detail	43	43	38	41	42	37	45	38	42	41.0
		Material	39	47	41	36	35	47	42	34	48	41.0
AVERAGE SCORE												**39.8**
Adaptability: Not adaptable												

Table 8 *Comparison of adaptation levels in studied urban areas in Vietnam*

City	Tam Dao	Bach Ma	Ba Vi	Sa Pa	Da Lat
Score	39.1	45.5	39.3	39.8	38.9
Adaptability	Not adaptable	Partial adaptation	Not adaptable	Not adaptable	Not adaptable

7. Conclusion

This paper presents the development of a technique to analyze the level of indigenous adaptation in urban planning and architecture. Exploring the significant elements that shape the indigenous adaptation in good cases of resort cities globally, the research study proposed an approach to use them to assess the indigenous adaptation of five cities in Vietnam, which were built be the French during their occupation of the country.

Three cities in Europe and in the USA were selected as examples. From these successful cases, there are three indigenous being discovered. The indigenous natural conditions (ENVIROMENT) describe the local weather and climate adaptive design, building plans that respect the natural topography, and building plans that respect the natural ecosystem of the area. The indigenous economic and technical conditions (ECONOMY) look into urban

development in line with local economy, developing local potentials, and designing flexibly using local materials and indigenous technology. The indigenous cultural and social conditions (SOCIETY) concern architecture needs to maximize the value of local cultural identity, architecture respects and promotes indigenous religious values and urban design towards indigenous communities. Planning and Architecture aspects were also considered, in which the planning specifically refers to the urban landscape elements and the technical infrastructure network system. Meanwhile, the architecture involves type (TYPE), shape (FORM) and Technique (TECHNIQUE).

A Likert scale of five level has been adopted to assess the resort cities using the established criteria, which includes "Fully adaptable", "Relatively adaptable", "Partial adaptation", "Not adaptable", and "Completely unsuitable". Applying to the cases of five cities, the conclusions are only Bach Ma City can be regarded as "Partial adaptation", while all other cities are "Not adaptable". Decisions should be made immediately for enhancing the level of indigenous adaptability of those cities. Further research can also look into the applicability of the technique to other indigenous adaptation situations.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *THLV, VHN, QTN;* ***data collection:*** *THLV;* ***analysis and interpretation of results:*** *VHN, THLV;* ***draft manuscript preparation:*** *THLV, VHN, QTN. All authors reviewed the results and approved the final version of the manuscript.*

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