



City gate as key towards sustainable urban redevelopment: A case study of ancient Gungnae City within the modern city of Ji'an



Yi-Chang Chiang^{a,*}, Yang Deng^b

^a Department of Architecture and Urban Design, Chinese Culture University, No.55, Hwa-Kang Road, Taipei City 11114, Taiwan

^b School of Architecture and Urban Planning, Jilin Jianzhu University, China

ARTICLE INFO

Article history:

Received 27 December 2016

Received in revised form

4 May 2017

Accepted 21 June 2017

Keywords:

Accessibility

City gate

Heritage

Space syntax

Urban redevelopment

Street network

ABSTRACT

Culture is a key tool for promoting sustainable urban redevelopment, by preserving the urban identity, attracting activities and visitors, and fostering the quality of life. While cultural heritage sites are characterized by a large concentration of visitors, causing increased traffic flows, it is necessary to provide optimal access to cultural monuments in terms of sustainable mobility. This study focused on the city gates that have access to the cultural World Heritage Site of Gungnae City within the city of Ji'an. Space syntax approach was used in the study to explore spatial accessibility by remodeling of city gate. It is of concern that the identity characteristics of a sustainable urban form and cultural feature of the city can be recognized through the spatial configurations of urban spaces. Spatial accessibility is regarded as an integral part of the sustainable use and contemporary expression of the cultural heritage. It is noted that accessible cultural monuments can perform their function for sustainable urban redevelopment. We argued that the city gates play a crucial role in the mutual interactions among urban spaces, street networks, and human traffic, and provide people with places on gate to stay. It is of concern that the city gate remodeling in the study enables overlapping use of ancient and modernized urban zones and offers an example of multi-layered street networks and mixed-use urban ensembles in terms of urban sustainability. We concluded that urban cultural heritage should be integrated into sustainable urban redevelopment strategies to enhance the liveability of historic cities while respecting their identities.

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1. Introduction

Culture is a key tool for promoting sustainable urban redevelopment, by preserving the urban identity, attracting activities and visitors, and fostering the quality of life (UNESCO, 2015). While cultural heritage sites are often characterized by a large concentration of visitors, causing increased traffic flows, appropriate management is needed in order to provide optimal access to cultural monuments in terms of sustainable mobility (Gabrovec & Viskovic, 2014). This paper focuses on the city gates that provide establish street networks and thus transport access to the cultural World Heritage Site of Gungnae City within the modern city of Ji'an. It is noted that only accessible cultural monuments can perform their function for sustainable urban redevelopment. Space syntax approach was used in the study to explore spatial accessibility by

remodeling of city gates. It is if concern that the identity characteristics of a sustainable urban form and cultural feature of the city can be recognized through the spatial configurations of urban spaces. Spatial accessibility is regarded as an integral part of the sustainable use and contemporary expression of the cultural heritage (Georgieva, 2013).

In the Materials and Methods section space syntax approach was used to explore city gate location and combination through the establishment of a spatial model of construction and street networks. As a result, this study presents the optimal accessibility to suture the spaces of Gungnae City and the outer city of Ji'an through gate remodeling and retain the historical and cultural characteristics of Gungnae City, thereby identifying a means to simultaneously satisfy both historical heritage protection and sustainable urban redevelopment. The location of the city gates plays a crucial role in the development of the street network and spatial development of the city (Malmberg, 2016). In the Discussions section, we discuss the consistency between historical heritage protection and urban development using a space syntax approach to investigate the spatial accessibility of Gungnae City. Based on an in-depth

* Corresponding author.

E-mail addresses: chiang106@gmail.com, jyz4@ulive.pccu.edu.tw (Y.-C. Chiang), 502314314@qq.com (Y. Deng).

examination of the accessibility of Gungnae City, this study incorporated the axial model analysis method to remodel the city gates for Gungnae City within the modern city of Ji'an. We argued that people-centered cities as culture-centered urban spaces needs appropriate urban planning of underutilized street networks and spaces. We concluded that urban cultural heritage in all its forms should be integrated into sustainable urban redevelopment strategies to enhance the liveability of historic cities while respecting their identities (UNESCO, 2016).

1.1. Gungnae City

Gungnae City, within the modern prefectural city of Ji'an in the People's Republic of China, was a fortress-city and the second capital of the ancient kingdom of Koguryo (or Goguryeo). Currently, the population density in Gungnae City exceeds ca. 280,000 people per square kilometer, which challenges sustainable urban development, by preserving the urban identity, attracting activities and visitors, and fostering the quality of life. Gungnae City is located in what is now Northeast China on the northern Korean Peninsula. The site was designated a cultural World Heritage Site in 2004 (UNESCO, 2004). In 1994, the State Council of the People's Republic of China declared the city of Ji'an to be one of the two national historical and cultural cities in Jilin Province. Geographically, the city of Ji'an has been a critical area for the political, economic, and cultural exchange among the dynasties of China, the ancient Korean Peninsula, and the Japanese archipelago. The historical and cultural meaning of the city has been considerably enriched over time. Furthermore, the regional cultural characteristic of the compatibility between ancient Chinese culture and the frontier minority cultures in the city is distinct from those of other cities in China.

Cities are like living organisms that go through constant change and transformation (Önder & Gigi, 2010). When the Koguryo people established their regime and moved their capital, they emphasized the relevance of natural geographical landscapes when selecting locations beneficial to their economic development and military defense. Because the geographical advantages of what is now the city of Ji'an satisfied the requirements for the Koguryo people to establish their capital, the Koguryo people constructed Gungnae City at that location. Generally, the spatial layout of the city of Ji'an has been planned in 20-year periods. Therefore, the historical changes in the urban form of Ji'an could be divided into three time points, namely 1981 CE, 2001 CE, and 2015 CE (Fig. 1):

- 1981 CE: The construction of the city was centered on Gungnae City, which primarily consisted of residential zones connected with public facilities. The overall development of the city was slow.
- 2001 CE: The development of the city was accelerated. The urban space was expanded eastward and toward the north side of Gungnae City. Because public facilities were concentrated around Gungnae City, the city of Ji'an has been expanded over time in rings centered on Gungnae City.
- 2015 CE: The construction of the city was further expanded eastward. Because the declaration of the world heritage status of Gungnae City was initiated during this time, some of the construction zones within the cultural site protection zones were moved. The excessive urban construction density in Gungnae City forced Ji'an to expand outwards.

1.2. Gates and streets

The main streets within the ancient Gungnae city have been preserved. Currently existing inside the city are one latitudinal

main street and two longitudinal main streets. At the outer northeast point of Gungnae City is a moat that is 9–10 m wide. At the outer south edge is a natural water trench, known today as Yuelian River. At the outer west edge is Tonggou River. These aforementioned three water bodies are critical elements of the spatial structure of Gungnae City (Fig. 2). In the past, the Koguryo people moved their capital to what is now the city of Ji'an, built a fortress on the foundation of the original city, and named it Gungnae City. The basic pattern of the ancient city has remained unchanged throughout the continuing changes in the city of Ji'an. Currently, the walls of Gungnae City are still clearly visible; the gates, watchtowers, fortified towers, culvert, and walls form a wall system that constitutes the crucial historical and cultural heritage of Gungnae City (Fig. 2).

The gates are the junction points of the spaces of Gungnae City and the outer city and provide people with places on gate to stay. Fig. 3 depicts the historical and current statuses of the gates. In the historical photographs, the gates can be seen intact. In the current environment, however, the ancient gates no longer exist because of street expansion. Thus, the functions of connecting the spaces of Gungnae City and the outer city to add to the appearance of a historical city and provide people with places on gate to stay are absent. It is of concern that cultural heritage as a major component of quality of life helps to satisfy human needs by providing symbolic meanings that bind cultural groups and communities across generations (Tweed & Sutherland, 2007).

The city gates play a crucial role in the mutual interactions among urban spaces, street networks, and human traffic. However, with increased levels of traffic, the city gates have come under threat in the past for impeding the flow of traffic. Following rapid socioeconomic growth, the resident population density of the former site of Gungnae City has expanded, causing a series of problems to the current city such as uncoordinated urban development and traffic congestion (Najd, Ismail, Maulan, Yunos, & Niya, 2015). It is of concern that the location and combination of city gates that enable overlapping use of ancient and modernized urban zones offer an example of multi-layered street networks and mixed-use urban ensembles in terms of urban suturing. The connection between cultural heritage and transport is of concern, as understanding an urban suture between forms and flows is more relevant in urban studies than demonstrating and planning (Martínez, 2014).

2. Materials and methods

2.1. Space syntax

The connection between cultural heritage and transport access is multi-layered, and only accessible cultural monuments can perform their function (Gabrovec & Viskovic, 2014). It also refers to something about the emergence of urban collective life, interactivity and sociability (De Boeck & Balaji, 2016). This study used space syntax approach to analyze the movement network to quantitatively measure spatial integration accessibility. This approach has been applied in numerous dimensions of urban planning such as urban traffic, urban spaces, social culture forming, and urban land use density (Hillier & Hanson, 1984; Hillier, 2003). The principle of space syntax offers the possibility of estimating theoretical accessibility by measuring integration (Foltête & Piombini, 2007; Hillier, 1996; Kang, 2015). Hillier and Hanson (1984) mentioned syntax theory indicated that the spatial distribution of buildings and towns profoundly influences the means and intensity of human activities and social interactions, and referred to spatial accessibility, network structures, and the relationship between spatial mechanisms and human activities. This approach

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