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Master planning for underground space in Luoyang: a case of a representative historic city in China

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Abstract

Luoyang is a representative historic city in China with 13 ancient dynasties ever locating their capitals here, featuring a possession of abundant historical resources like historical sites, tombs, and buried relics. With the rapid spread of urbanization, Luoyang is facing the dilemma of urban redevelopment and the conservation of historical resources, and this dilemma is particularly pressing when it comes to the utilization of underground space, which has been manifested to be an effective way to address the problems of urban development. In this context, the master planning for underground space in Luoyang was conducted. This paper will first analysis the relationship between urban development and the conservation of historical resources in Luoyang, and then give a brief introduction of the master planning for underground space, which will focus principally on the overall layout of underground space development and the general approaches to deal with the conflict between the rehabilitation and conservation of historic districts. The case will provide insights with regard to the utilization and development of urban underground space for other historic cities that is abundant with historical resources, especially the buried ones.

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1. Introduction

Located in the center area of China, Luoyang had always been an important city in Chinese history, with 13

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ancient dynasties ever locating their capitals here. Luoyang (hereinafter referring to the urban area of Luoyang) covers an area of 803 km² with a population of 1.96 million (Luoyang Statistics, 2015). Luoyang lies in the northwest of Luoyang Basin with two main rivers running through the urban area, which is regarded as good “feng shui” in ancient Chinese ideology.

The long and colorful history has endowed Luoyang with abundant historical resources. As of 2015, there are 3 UNESCO World Cultural Heritage Sites and 43 officially protected monuments and sites at national level distributed across Luoyang.

With the rapid spread of urbanization, Luoyang is facing the dilemma of urban redevelopment and the conservation of historical resources, and this dilemma is particularly pressing when it comes to the utilization of underground space, which Luoyang has to face during the upcoming era of metro construction. Hence the master planning for underground space is a crucial issue for urban development of Luoyang.

2. Demand Analysis for the Use of Urban Underground Space (UUS) in Luoyang

The conflict between urban redevelopment and the conservation of historical resources in Luoyang has led to the problems as follows:

Spatial limitation

The spatial limitation problem of Luoyang can be concluded into two aspects. In terms of the whole urban area, urban sprawl is constrained by surrounding historical sites (Figure 1) that there is only one allowable sprawl direction remaining for urban development with respect to construction land. Meanwhile, the requirement of height limit also put considerable redevelopment pressure on conservation area, which is serving as an important commercial area in Luoyang.

Traffic congestion

The conservation area generates and attracts extensive trip volume due to tourism and commercial value. Moreover, the traditional urban fabric shaped by history has resulted in the situation where the roads in conservation area are too narrow to alleviate the traffic congestion. Furthermore, chronic shortage of parking is making the traffic condition even worse.

Disadvantaged living environment

Owing to the first edition of Master Plan of Luoyang, Luoyang adopted what is called as “Luoyang Conservation Scheme”, which suggests urban development should put less pressure on old city and focus more on the construction of new areas. Therefore, conservation area of Luoyang lags far behind as regards infrastructure and living environment comparing with Jianxi District and New District Core Area.

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