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Substructure and Superstructure Functions of Shushtar Historical Hydraulic System from the perspective Urban Infrastructure and Facilities

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Introduction

Issues such as: What prompted the construction of the Shushtar Historical Hydraulic System in the past? Is it conceivable to utilise its infrastructure services more widely by restoring the Shushtar Historical Hydraulic System? What Urban Planning solutions may be used to improve the quality of Shushtar city? These are the motivations for presenting and writing this paper. The Purpose of this paper is to introduce and investigate the substructure and superstructure functions of Shushtar Historical Hydraulic System in terms of urban infrastructure and facilities.

Dealing with the Shushtar Historical Hydraulic System is necessary because they are a UNESCO-listed work that still performs their intended duties. Furthermore, as cities have depended on water and their vicinity for thousands of years, considering this issue is crucial (Bastier, 1998: 212). Along with food security, economic growth, and health development, water is essential for human life and preservation (Saatsaz & Rezaie, 2021: 2). Water is regarded as a national resource and does not belong to any one location, much like oil is (Catalani, 2017; Willems et al., 2015). It is also known as a material, mental, and spiritual heritage. For human life to advance, water projects must be expanded and put into action. Also, water resources management is important to achieve sustainable development. Sustainable development is the path that cities follow to overcome urban challenges (Abdolabbas, 2021).

Iran has had a long history of water scarcity, which has prompted the deployment of clever and practical strategies to deliver water and reduce water waste. One of the first civilizations to manage water resources and invest in water infrastructure was ancient Iran (Saatsaz & Rezaie, 2021: 2). Iranians adopt the most cutting-edge irrigation techniques to irrigate agricultural regions, since agricultural water management is a complex problem with social, historical, and economic dimensions (Najaflo, 2019: 27).

One of Iran's plains, Khuzestan Plain, has long needed water. Due to the presence of the Karun, Karkheh, and Jarrahi rivers, the Khuzestan plain, where a portion of Mesopotamian civilisation originated, has been a significant location for life since the dawn of time. The medieval city of Shushtar was established adjacent to the Karun ridge, because of the region's high heat and lack of rivers (Majedi & Esteghlal, 2010). Many

early cities were established along rivers due to these factors. The city of Shushtar was the first human habitation in Iran, according to renowned French archaeologist Professor Girshman, who places its age at ten thousand years. It served as the provincial capital of Khuzestan during the majority of historical eras, from the Sassanid era to the Pahlavi era (1303).

The city of Shushtar was the first human habitation in Iran, according to renowned French archaeologist Professor Girshman, who places its age at ten thousand years. It served as the provincial capital of Khuzestan during the majority of historical eras, from the Sassanid era to the Pahlavi era (1303), and benefited from a unique position because of its old civilization and history. This medieval city, which is situated on the Zagros mountain range's slopes, is home to priceless old artwork and structures.

Its most famous ancient work is the collection of Shushtar water structures as a "masterpiece of creative genius", which has caused this city to be known as the capital of water structures in the world. The initial construction of Shushtar Historical Hydraulic System dates back to the Achaemenid period in the fifth century BC and the reign of Darius the Great, and the major part of its construction is related to the Sassanid period (UNESCO). The purpose of building this complex is to manage, control and utilize water power, as a driver for industrial mills (UNESCO-Iran National Commission, 2015), as well as agricultural irrigation, drinking water supply, transportation (water), security and defense. The Shushtar Historical Hydraulic System, with the title "the world's largest water museum" and as the second national work after Naqsh Jahan Square in Isfahan, which is located in the middle of the urban space, has had a significant impact on shaping the urban space and improving the living standards of the residents (Majedi & Esteghlal, 2010: 2).

The Shushtar Historical Hydraulic System includes thirteen historical works: waterfall and mill, tower, dam, bridge, castle, river/stream/canal, and tunnel, each serving a different purpose of water supply. It was added to the UNESCO World Heritage List in 1388 as the tenth Iranian work under the name "Shoshtar Historical Water System" (UNESCO). The renowned French archaeologist Jane Dieulafoy cited this complex as the largest industrial complex existing prior to the industrial revolution during one of his expeditions (Wikipedia).

The management of water resources, the production of art, and the development of distinctive structural architecture were the main drivers behind the construction of this complex. Additionally, the development of this complex serves several other purposes, such as improving social and environmental conditions, providing access to electricity, facilitating traditional and strategic water management, enhancing urban aesthetics, and addressing economic issues (Majedi & Esteghlal, 2010: 4; Mardani, 2011: 3).

The collaboration of science and art professors was a factor in the design of the Shushtar Historical Hydraulic System. These constructions function peacefully with one another because the materials used in them are chosen in accordance with the surrounding environment and natural laws (Mardani, 2011: 3).

Methodology

The method used in this research is qualitative and involves a case study in which the Shushtar Historical Hydraulic System was selected as a special water supply structure

and investigated from different aspects. Additionally, in this research, the method of recording records is used, in which relevant articles and research are used as sources.

Results and Discussion

Because the residents of Shushtar employed these water constructions to supply their water sources and irrigate agricultural regions, their effects on the city were bigger than those on the province and the nation in the past. Its significance in the province and the nation has grown as a result of the decreased use of water resources, the destruction of some of these structures (drift, collapse, abandonment), its listing as a cultural heritage site, and the influx of tourists to this city. As a result, it is important to think about practical solutions for ensuring its stability in the areas of infrastructure and superstructure.

Conclusion

Water management: Considering the local natural and social conditions, including those in Shushtar Historical Hydraulic System, is important when developing and implementing water projects because they assist raise the standard and level of people's lives. Pre-planned water programs are therefore required, especially in structures that serve as the infrastructure for water supply. In order to utilize the city of Shushtar's water resources, it is required to increase the influence of these constructions by reviving and restoring the abandoned and ruined portions, as in the past.

Energy supply: Mills can be used to provide green energy, electricity, and electricity. Mills are a practical, sustainable, and environmentally friendly technology that contributes significantly to social and economic growth.

Environment (sustainable development) and urban landscape: It is necessary to abide by the law in order to prevent water pollution, to prevent pleasure boats from traveling through the Karun River due to the destruction of the last remaining dams, to build a false ceiling over the complex's waterfalls, to prevent the discharge of sewage from the city into the complex, particularly into the Dastkand-Gergar River, and to remove project.

Economic and industrial difficulties are improved by the effectiveness of the Shushtar Historical Hydraulic System, as it has been used in the past to improve these two categories.

Cultural planning is required to identify and restore the miller culture, including their traditions and way of life, as well as training in mill construction, maintenance, and repair. In keeping with the exchange of human values and the advancement of technology, urban planning, and landscape design, it should also be emphasized the values of cultural heritage and the cultural landscape of these structures.

Tourism: As previously mentioned, due to the city of Shushtar's water constructions being registered as cultural heritage, it is one of Iran's most valued tourist destinations that attracts numerous visitors from both inside and outside the country each year. Priorities should include paying attention to the parts that are being destroyed, such as Salas Castle. Additionally, positive outcomes in the preservation and survival of these ancient sites can be seen, thanks to a set of laws established by the Ministry of Tourism and followed by visitors.

Keyword: Water management. Shushtar water structures. Sasanian period. UNESCO.

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