Sustainable Urban Development Using Underground Space Development Approach-A Case Study: Tajrish Square, Tehran

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Extended Abstract
Using underground spaces is one of the new approaches in sustainable urban developments. This approach is intended to solve some urban problems such as shortage of spaces, traffic and environmental issues. This research aims to introduce various underground spaces, their aspects and benefits in the context of urban underground development. In this paper, after defining the problem and explaining its importance, the concepts of sustainable development and underground spaces are described. Underground spaces are then analyzed from climatic, traffic and environmental viewpoints. As a case study, the underground development of Tajrish Square is proposed.

Introduction
In the past ages, underground spaces have been used due to traditional needs and reasons; but in the contemporary age, extensive construction and use of underground spaces are a new approach in urban development in the world and especially in Iran. Studying the history of the subject indicates that today with the advent of technical inventions and modern evolutions, the development of such spaces especially urban infrastructure are essential due to increasing unfavorable climatic conditions, transportation problems, lack of space on the surface, and environmental pollutions, in addition for the purpose of safety and security improvement. A new approach is introduced in this paper to solve urban problems and supply urban needs such as urban infrastructure, tunnels, underground parking, storages and refineries.

Methodology and Approaches
Underground development approach has been used in this research considering historical, descriptive and analytical methods in a case study. The methods and software programs used in this research include GIS, AutoCAD, and other software programs for analyzing, designing and rendering.

Results and Conclusions
The results of this paper show that underground spaces have basic and positive potentials in the sustainability context. These potentials consist of having a constant temperature, sustainability in harsh climates, stability in critical conditions and accidents, source of space, energy, etc. Urban underground development approach can be used for solving urban problems and upgrade sustainability. In Tajrish Square, transportation problems, unfavorable climate, lack of space, in addition to distinctive natural, historical and cultural features are observed. Using people-oriented qualities of urban design and alternatives of underground development from minimum intervention to maximum intervention are presented. After the assessment of the above-mentioned influencing factors the best alternative is selected. Ultimately urban underground space design framework and guideline with emphasis on Tajrish Square are presented in this research.