

**DAMAGES AND POLICY SOLUTIONS FOR PEDESTRIAN BRIDGES IN TEHRAN, IRAN**Nasim Sahraei Nejad<sup>1\*</sup> & Ahmad Hami<sup>2</sup><sup>1</sup>Environmental Design Department, Faculty of Natural Resources and Environment, Islamic Azad University, Science and Research Branch, Tehran, Iran.<sup>2</sup>Landscape Engineering Department, Faculty of Agriculture, University of Tabriz, Iran.**ARTICLE INFO****Keywords:**

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**ABSTRACT**

Numerous pedestrian bridges are the result of a car-oriented approach in the Tehran transportation network. Considering the vast maintenance costs and unacceptable functional efficiency, it is essential to change the planning approach from car to pedestrian in Tehran. This study attempted to the pathology of pedestrian bridges in Tehran and provide effective and timely policy solutions for them using the Content Identifying Method (CIM) and summarizing necessary measures from different studies. Solutions will be offered at different levels, from short to long-term solutions. This study concludes that pedestrian bridges should be re-evaluated in terms of location, design, continuous transportation network, and maintenance to improve quality of life. These solutions should be implied at the proper period with consideration of the needs of citizens and the existing issues of pedestrian bridges. They can be done based on management mechanisms by creating inter-sectoral coordination between related organizations and institutions.

**1. INTRODUCTION**

Tehran, as a Metropolis in recent decades, due to many reasons, especially rapid and irregular growth and also because of loading more than the capacity of the land, confronts many issues and challenges in urban management. Finding a comprehensive solution for these issues is a challenging task. As part of this network in urban areas, one of these issues is related to the transportation network, especially pedestrian bridges. According to the FHWA report, some principles provided for an urban transportation network are cohesion, directness, accessibility, alternatives, safety, security, and the network's comfort (FHWA, 2016). Ensuring that people experience these properties in their urban areas can assure that urban areas can affect the quality of life and their inhabitants' sense of connection (Cullen, 1961). As a part of this network, logically, pedestrian bridges must meet these principles. Although the pedestrian bridges in Tehran, over time, were just built for a safe route from rider passages, today, for many reasons, they created different problems for citizens and urban management. Pedestrian

bridges are the product of a car-oriented attitude that began in the 20<sup>th</sup> century. Because they can completely separate pedestrians from riders, and significantly reduce accident statistics (Soltani, 2013). Pedestrian bridges also have the potential to enhance the visual qualities of urban spaces (Sharbati, 2015).

On the other hand, pedestrian bridges can be a space for urban advertising and a source of income for the relevant organs. Also, their simple structure provides them with a simple process of construction. The location and construction of these bridges are subject to the regulation and rules of each country. It has been over half a century since the first pedestrian bridge was constructed in Tehran, and now it has around 850 pedestrian bridges over the city. However, the evidence shows that the functional efficiency of these bridges is not at an acceptable level. Some studies claim that around 50% of the bridges in Tehran do not have the desirable performance (Ahmadi, 2002) (Fig.1).

\*Corresponding author: [n.sahraienejad@gmail.com](mailto:n.sahraienejad@gmail.com)



**Figure 1:** Low Functional Efficiency of Pedestrian Bridges in Tehran

Another research in Jakarta, Indonesia, shows that the use of bridges is an unfair approach that consumes more time and energy from pedestrians and, at the same time, does not match all the conditions and requirements of them and finally, due to this reason, citizens use 65% of the pedestrian bridges in the city (Leather et al., 2011). Another study in Tehran in 2017 showed that level passages generally are more desirable for citizens than crossing the same passage using pedestrian bridges. The same study claims that mechanized pedestrian bridges are preferable to ordinary ones (Kashanijou et al., 2019). On the other hand, according to Blackburn et al. (2016), pedestrians are among the most vulnerable road users, accounting for approximately 16 percent of all roadway fatalities nationally. Unofficial statistics indicate the daily death of thirteen pedestrians in Iran. While according to international estimates, the largest age group of pedestrians killed in traffic accidents are people over 50 and then children ten years and younger, and it is precisely these people who, for various reasons, may be less likely to use pedestrian bridges (Mohammadzadeh, 2016). The impossibility of using disabled people and mothers who carry their children's strollers is another issue that has made it difficult for pedestrian bridges in urban spaces. However, municipalities must adapt urban spaces for all people, even those with disabilities (Rules and Regulation of Urban Planning and Architecture for People with Physical Disabilities, 2009). However, a review of the rules and regulations for the design of pedestrian bridges in various countries, including the United States, the United Kingdom, and Ireland, have emphasized using ramps and elevators for mechanization of pedestrian bridges and these documents do not mention escalators as a suitable solution to facilitate citizens' use of the pedestrian bridge. In Tehran, most mechanized bridges have utilized escalators (see Fig.2).



**Figure 2:** Utilizing Escalator for Mechanized Pedestrian Bridges in Tehran

Disturbing the urban landscape is another issue created due to not paying attention to the aesthetic criteria in the design process of bridges on the one hand and the existence of many bridges in urban spaces that blinding some natural or valuable landscapes on the other hand. A study on designing and constructing pedestrian bridges in Tehran shows that planners and designers only try to provide a passage for pedestrians without attention to their aesthetic qualities, especially their relationship with the background around them. It means that these bridges are constructed only based on one or two design standards, without considering the visual characteristics of the surrounding environment and harmonizing them with each other. This process cannot be considered a context-sensitive design process (Sahraeinejad, 2014) (Fig.3). Also, pedestrian bridges in Tehran disturb the skyline in the urban landscape and act as a visual disturbance. At the same time, in mechanized bridges, due to the bulky structure of escalators, a negative, ugly and unsafe space is created under them, which in many cases becomes a place for garbage collection or the establishment of vendors and homeless people.



**Figure 3:** Design Standards for Pedestrian Bridges in Tehran Urban Areas (Pedestrian Bridges in Tehran are not Context Sensitive)

Meanwhile, according to the report of the Tehran Beautification Organization in 2018, the average construction cost for each ordinary pedestrian bridge is more than five billion Rials, and each mechanized pedestrian bridge costs about 35 billion Rials. One of the most crucial challenges that urban management faces is providing high costs for constructing and maintaining pedestrian bridges in the Tehran metropolitan, consequently confusing the bridge management process. In addition, the heavy maintenance costs of pedestrian bridges have caused urban managers to install billboards on the bridge deck to generate revenue and provide these costs. In turn, advertisements on the bridges create dangers inside or around the bridge. Advertisements affect the primary function of pedestrian bridges, and in some cases, the safety of pedestrians has been wholly disrupted due to the complete coverage of the bridge deck. In addition, advertising will disrupt drivers' focus, especially on highways, and lead to accidents (Khaki et al., 2012:13). These all affect the safety of bridges and their mental impact on citizens and the quality of sidewalk space, finally reducing the functional efficiency of pedestrian bridges (Fig. 4). Therefore, according to this amount of costs and the failure to achieve the expected performance, it is necessary to re-evaluate the issue of pedestrian bridges in Tehran, both in terms of policies and also the need for reviewing in the location, technical terms, and conditions of construction and maintenance.



Figure 4: Advertising on Pedestrian Bridges in Tehran

Solving the problems of pedestrian bridges is a multidimensional issue that needs to be explored in all its dimensions. Therefore, there are three main questions for this study; the first is what are the damages and consequences due to the presence of numerous pedestrian bridges in the metropolis of Tehran? Second, what are the proper alternatives for pedestrian bridges in Tehran's urban spaces? Moreover, the third is what are the practical solutions to prevent the development of these damages?

## 2. RESEARCH METHODOLOGY

This study is based on the Content Identifying Method (CIM). The data required for this research was gathered through library and documentary studies (definitions, concepts, theories, and approaches related to the subject of pedestrian bridges and their performance

in urban spaces) as well as field studies (Study of the condition of pedestrian bridges will be collected in different urban spaces of Tehran and compared with successful global experiences in this field). Then, based on the obtained data, the pathology of the current condition of pedestrian bridges in Tehran's urban areas and then the adaptation of the current situation to the theories and approaches have been done. Finally, solutions will be offered at different levels (short, medium, and long-term) by summarizing the necessary measures from different studies.

According to these studies, the pathology of pedestrian bridges in Tehran is summarized in Fig.5.

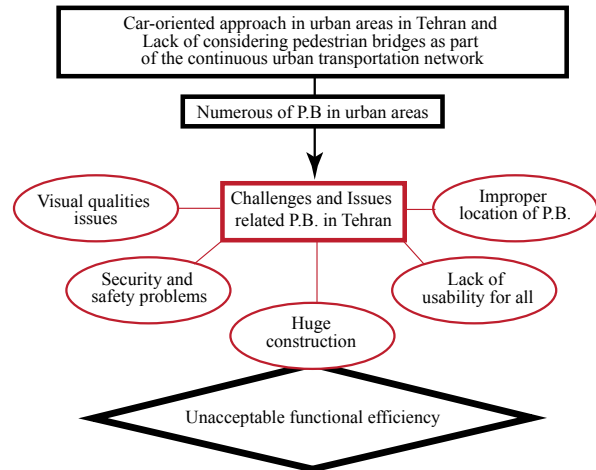


Figure 5: Pathology of the current condition of pedestrian bridges in Tehran (Source: Authors)

According to this diagram, the most important reason regarding the unacceptable functional efficiency of pedestrian bridges in Tehran resulted from their different challenges and issues, which resulted from numerous pedestrian bridges in urban areas. Finally, all these problems are related to having a car-oriented approach in planning urban areas and neglecting pedestrian bridges as part of the continuous network of urban passages.

Aside from specific issues and problems related to pedestrian bridges, on a larger scale, it seems that the urban management of Tehran metropolis, like others in developed countries; needs to change the approach from car-oriented to pedestrian-oriented because experiences have shown that the continuation of the past approach will not lead the success. With the adoption of this policy, pedestrian bridges will change dramatically because they are a phenomenon resulting from the car-oriented ideology. In the pedestrian-oriented approach that, for the past half-century, it has received much attention in different countries of the world, priority is given to pedestrian movement; therefore, the comfort, safety, and security of pedestrians and paving the way for a continuous pedestrian network in urban areas are as a necessity (Park et al., 2014; Wood et al., 2010). In the car-oriented approach, pedestrians guide by bridges or underpasses to minimize any disturbance in the movement of cars; at the cost of maintaining the comfort and safety of the rider, the pedestrian faces problems that can sometimes have social and psychological dimensions. However, in the pedestrian-oriented approach, the comfort, safety, and security of pedestrians are given priority over-riders, and then using the level difference



to cross the passages loses its position as a critical solution. Thus, by force, urban management must pursue one of the following two general policies: The first policy is maintaining the current situation by a car-oriented approach and just making minor corrections to it, and the second is changing the approach from car-oriented to car pedestrian-oriented. The consequences of this change in attitude can be summarized in Fig. 6:

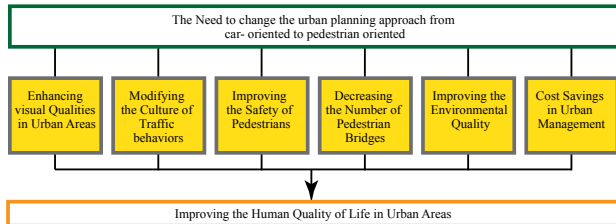


Figure 6: Consequences of Changing the Approach of Urban Management concerning Pedestrian Bridges in Tehran

According to this diagram, to improve the human quality of life in urban areas in Tehran, we need to change our planning approach from car-oriented to pedestrian-oriented in order to enhance the visual qualities, modify the culture of traffic behavior, improve the safety of pedestrians, improve environmental quality, decrease the number of pedestrian bridges in urban areas and finally save cost in urban management processes.

3. POLICY SOLUTIONS

The proposed solutions to implement this policy can be classified at different levels as short, medium, and long-term solutions as follows:

In the short-term solutions (period of one to three years), it may check all the pedestrian bridges in terms of location and efficiency: This should be done by preparing a control checklist. It will eventually lead to removing or modifying bridges that do not have a proper location or acceptable performance. This checklist should include some criteria such as the type and width of rider access, Average speed of passing vehicles, number of passing vehicles per hour, ability to see vehicles by pedestrians and vice versa, Number of pedestrians using the bridge during peak hours, land uses around the bridge, reviewing the design process of brides that should be in a context-sensitive manner and also the method of mechanization of bridges in order to regard the rights of disabled citizens, that all needs to be completed by trained people at the right time using the information available in the Deputy Minister of Transportation and Traffic. Moreover, it is necessary to conduct a practical study to update alternative methods for pedestrian bridges that match the physical, cultural, and economic situation in different urban areas.

In the Medium-term solutions (period of three to five years) primarily, it is necessary to establish intersectional coordination between urban management organizations in order to determine the critical measures for the development of the pedestrian’s

facilities plan and prepare a specific and timed plan that explains the position of pedestrian bridges in this plan. The second is to prioritize alternative solutions instead of pedestrian bridges such as constructing underpasses, calming traffic by creating physical barriers, and using smart traffic tools. Applying these alternatives and providing a comfortable and continuous transportation network is also effective for increasing social interactions and the vitality of urban spaces. At the same time, it will prevent visual disturbance caused by numerous pedestrian bridges and other issues that result from them, as mentioned earlier. Each alternative solution may have some advantages and disadvantages, as shown in Table 1.

Table 1: Advantages and disadvantages of proposed Alternative Solutions to Pedestrian Bridges.

Alternative Solution	Advantages	Disadvantages
Use the Underpass	-Possibility of commercialization -No disturbance in the urban landscape -the Increased psychological desire to use	-Difficulty of executive operations -Impossibility of use in all passages - safety problems
Calming Traffic by Creating Physical Barriers	-Eliminate P.B. and reduce maintenance and maintenance costs - Ease of use for all citizens -No disturbance in the urban landscape - Increasing the use of citizens	-Negative effect on traffic on busy roads -Impossibility of use in all passages -Reducing the safety factor of pedestrians
Use of Smart Traffic Tools	- Eliminate P.B. and Provide no possibility of crossing on foot in a level manner - Creating suitable conditions for the safe passage of all citizens, especially the disabled and the elderly	Need to provide technical infrastructure - Lack of a culture of use among citizens

Then in the third step, culture building in the field of improving the traffic behaviors of citizens through mass media, education in schools, and face-to-face citizenship education, also improving existing pedestrian bridges for their aesthetic qualities and promoting their safety and security and finally removing advertising from pedestrian bridges and, if necessary, using façade advertisements, around the bridge. In the long-term solutions (5 to 15 years), the first step is changing from a car-oriented to a pedestrian-oriented approach in urban areas, creating a continuous network of pedestrian crossings independent of the rider network, and considering the pedestrian bridges as a part of this network. Therefore, pedestrian bridges should be constructed only in areas with no better alternative solution for safe pedestrian crossing across the rides. Achieving these results requires changes in the structures and decision-making processes and the attitude of urban management regarding pedestrian bridges. Also, reviewing the policies for loading public buildings along highways to minimize the need for pedestrian crossings is the second long-term solution. The final solution is using the possibility of combining pedestrian bridges with surrounding architectural elements, especially for the pedestrian bridges around commercial complexes and service centers. This solution, in addition to improving the bridges’ position to an element integrated with architectural elements, also removes the maintenance cost of the bridges from the municipalities.

#### 4. DISCUSSION

First, in parallel to Development and Research Management (2011), it seems necessary to change the attitude among city managers to create and expand pedestrian bridges. Minnesota Local Road Research Board in 2014 suggested pedestrian bridges are just one treatment among appropriate treatment options for crossing locations such as Crosswalk Markings, Warning Signs, Center Median with Refuge Island, School Crossing Guards, or underpass, which are selected based on the pedestrian crossing evaluation criteria. Jesse Cohn and Elliot Sperling (2016) believe that providing pedestrian accommodation in urban areas leads to some direct benefits, such as connectivity and safety, and some indirect benefits such as accessibility, health, sustainability, cost savings, social equity, and enhancing the functional efficiency of pedestrian accommodation. Moreover, Nazemi and Mohagheghnasab (2014) emphasized the need to review the design, construction, and use of pedestrian bridges in Tehran's urban areas. This study proposes that we need to change the approach in urban planning from car to pedestrian oriented and consider pedestrian bridges part of a continuous network of urban passages. According to WPI-Pedestrian Bridge Study, the Seattle Department of Transportation (2014), and also Sahraeinejad (2019), pedestrian bridges should fit into the existing landscape and not disturb the skyline in the urban landscape. To achieve this, the design of the bridges must be sensitive to the urban context in which it is located. This study proposed that if there is a necessity for installing a pedestrian bridge, it must be designed in a context-sensitive manner. Moeini (2014) offer solutions regarding the considerable number of pedestrian bridges in urban areas, such as utilizing underpass or using physical barrier instead of pedestrian bridges. This study proposed prioritizing alternative solutions such as underpasses, calming traffic by creating physical barriers, and using smart traffic tools instead of pedestrian bridges in urban areas.

#### 5. CONCLUSION

This study concludes that pedestrian bridges are proposed as a suitable solution for pedestrian movement and road-crossing in the city. However, they become an issue for both citizens and urban management part. Urban areas have an important responsibility to be accessible, functional, and safe with aesthetic qualities for all to walk. In a car-oriented approach, pedestrians are part of a continuous transportation network and consider their safety more than their accessibility. In a pedestrian-oriented approach, improving pedestrian safety and accessibility is a key issue for planners, designers, and citizens. (Planning and Designing for pedestrians, 2002) Therefore this study concludes that primarily, to reduce problems regarding the pedestrian bridges in urban areas in Tehran, the most important action as a long-term solution is changing from a car-oriented to a pedestrian-oriented approach in urban management in order to establish continuity in the urban transportation network by considering alternative options instead of pedestrian bridges.

In addition, the need to apply policy solutions at different levels to change the approaches and solve the problems of pedestrian bridges in urban areas and also enhance the quality of life; these solutions should be implied at the proper periods with consideration of the needs of citizens and the existing issues of pedestrian bridges. The above policies can be based on management mechanisms and by

creating inter-sectoral coordination between related organizations and institutions. However, to solve these problems, it is necessary to take all these solutions in full cooperation with all involved organizations and areas of Tehran Municipality and the form of a specific and planned agenda.

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