

## Relating to pedestrian Route and Expressway\*

### (Case study: Resalat expressway; The part joining Bayhaghi and Seyedkhandan terminal)

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#### Abstract

Due to recent urban developments, the undesirable presence of pedestrians along urban expressways for access to public transportation facilities, daily trips and evading traffic is a typical trend. This problem decreases the urban life quality and health of citizens in a metropolis like Tehran. New viewpoints consider this daily travel along “expressway landscapes” as a kind of “everyday nature”. It is important to notice that, the meaning of everyday nature and what be perceived in everyday landscape are different from a park or sites with recreation, sports goals. Review of debates over “presence of pedestrians along expressways” shows the opposing views have reduced dramatically over time. This article addresses the quality of “pedestrian connections improvements” along expressways and their related aspects of programming and design. The research is based on the case study of Resalat expressway, as one of most important population core and transportation systems of Tehran. The question is can landscape architects use bridges, existing sidewalks, parallel pedestrian, green patch and other facilities to plan a “continuous pedestrian connection” where daily travel is requested? Does experiences like Tabiat bridge in Tehran or Highline in New York, which both are recreational places, have a role in development and improvement of such pedestrian connections as an everyday nature of cities?

The framework is based on “Forman model of landscape ecology” and “viewpoint of Kaplan about everyday nature”; through using case study/combined research strategy with synthesizing case procedure. After evidences review, phenomenon survey in the following steps. First is inspect and analysis of “quality-oriented approach of landscape”, “landscape ecology of Forman”, “Kaplan’s view point of everyday nature”, definitions and principles of “pedestrian and expressway design”. Second is study of real cases and acquire essential needs for design research through the production and use of a template module of analysis which is generated from the previous step. Third is case study area Pathology and quality of related improvement identifying. This step also uses the previous step structure of template module of analysis. Final step present the findings and Indicators to identify demands for improvement (table5) and some standard offer for this kind of design (table6), which can be generalized to similar problems in other situations (transferability).

Findings associated with proponents of “pedestrian presence along expressways”, conditionally consider “pedestrian connecting” along expressways as an opportunity. It’s important to consider this kind of request for commuters as a real aspect of today cities. This phenomenon can be “ignored”, “prohibited” or “improved as an opportunity”. Last approach have a holistic theory to balance the needs of city with new conditions to achieve higher quality of everyday urban life.

#### Keywords

Pedestrian connection, Everyday nature, Expressway landscape, Design research.

\*. This paper is derived from the studies of Seyed Amir Hashemi zadegan’s master thesis entitled “Pedestrian connection and urban expressway, case study Resalat expressway Between Bayhaghi and Seyedkhandan terminal” carried out under the supervision of Dr. Seyed Hassan Taghvaei in Shahid Beheshti University, Tehran, Iran (2013).

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## Introduction

The fundamental effects of urban roads system is one of the important problems in high density growing cities. The problem by itself especially due to increased traffic, environmental pollutants and many disorders in visual impacts and lots of cars impaired the quality of citizen health and life. Although these infrastructures have a decisive role in vital services of modern city life, but the adverse consequences of those on the quality of people's daily activities cannot be ignored.

Knowing these adverse consequences, development of knowledge and science beside the integral philosophy, generate new viewpoints and concerns like everyday nature, landscape ecology and integrating infrastructures and open space planning among professionals of landscape architects and open space designers in addition to classic designing parks, recreations, entertainment, sport and roam spaces. In this approach attending to landscape as an everyday nature which human constantly live and exist while it is very important; and the proportion of it to recreational open spaces can be attributed to prevention to treatment.

In this regard, issue of fatigue and depression, which is coincided with frustration, wasting time and money, recognized as a daily problem of people who walk or ride along ex. and highly regarded. For example this problem can be seen obviously in many ex. of Tehran like Resalat, Haghani, Hemat, Hakim, Yadegar Emam and Chamran. In these corridors, certainly in peak of morning and afternoons, you can see many pedestrians who presence along expressways. This Phenomenon, which is highly increased, is due to access public transportation systems, daily short trips and evading from traffic.

So this article addresses quality of improving pedestrian connections along urban expressways and their related aspects of programing and design. Therefore the subject of research based on the case study pertaining to a section of Resalat expressway, situated between Bayhaghi and Seyedkhandan terminals, which is considered as one of most

important population core and transportation systems of Tehran, includes numerous problems in accordance to pedestrian commute alongside expressways. How can use bridges, existing sidewalk, parallel pedestrian, green patch and other facilities to plan a continuous pedestrian connection where pedestrian is requested? Does experiences like Tabiat Bridge in Tehran or Highline in New York, which both are recreational places, have role in development and improvement of such pedestrian connections as an everyday nature of cities?

Literature review shows that the presence of pedestrians along urban expressways has its proponents and opponents. But the opposing views have reduced dramatically over time, and now a large number of study and research is focused on how pedestrian connections must be created along expressway corridors. For example and as an important fact, planning researches like comprehensive county expressways planning study of Santa Clara (Scgov, 2008) or the activities of nonprofit national organization of Making America a Great Place to Walk (America walks, 2005) are focused on the quality of presence, safety and security which have led to real pragmatic projects (Table 2).

As an important point, most studies of pedestrian improvement along expressways outside Iran can be classified in four categories based on historical period. First period, the emphasizes is on development of sidewalks, such as complete sidewalk gap analysis of America, second period, concerns Pedestrian-Transit Connection Analysis, such as pedestrian crossing improvements around TriMet (Tri-County Metropolitan Transportation District of Oregon) bus stops on four state highway corridors in the Portland, Oregon metropolitan (Trimet, 2012). In the next period, Continuous pedestrian routes were considered for short trips as a transportation system, such as the Capitol expressway pedestrian and bus improvement project (Fitzwater, 2010), and last in fourth period, studies have concerned road ecology; such as increasing biodiversity in public

landscapes and study of the interaction between road networks and the natural environment and eco-paths (NYS green, 2012 & Caltrans, 2013 & OREG, 2010). In many internal researches many various related topics such as urban landscape, pedestrian, expressways and urban development have been studied separately. In this case, such studies like evaluation of pedestrian crossing facilities defects in Tehran (Hassanpour, et al, 2012), the effects of urban expressways in Tehran's urban landscape conversion (Mahmoudi, 2002), approaches and methods in urban aesthetics (Karimi Moshaver, 2013) or pedestrian planning in Tehran with a focus on social needs (Mansouri, et al, 2012) can be noted. Although integration of these studies never takes effect and cannot produce a decision as an organized suggestion or method, they can present an approach or tactic for practice along expressways of Tehran. Therefore, internal studies are mainly focused on recreational spaces or have a segregate view of point

in a standalone filed (locating bus stops and etc.) or concerns on the need of cars rather than everyday nature which as a real phenomenon people in cities directly and constantly face along expressways (Fig. 1). As a result of changes in population, society and economic systems of cities, along the expressway corridors as part of urban spaces for short trips, are examples of the daily landscape which is different from definitions and expectations of the modern era science (positivist paradigm) which considers roads as vehicle territories without flexibility, variability and relation to other spaces within the city. Despite the high risks and low quality of informal paths, the high demands of using these corridors and preferring those over other systems is the witness of these changes (Fig. 1).

It should be noted with regard to this research study area, two projects have been defined in comprehensive study of region seven of Tehran municipality. These two projects are Resalat expressway improvement in



Fig. 1. Up right, east to west of Resalat ex. Before Haghani expressway exit, trip to accessing Mossala metro station. Up left, west to east of Resalat expressway near Mossala; Ghanbarzade street exit, trip to enter the downtown. Down left, east to west Resalat expressway before Eshghbaz Bridge, trip to accessing terminals. Down right, a sample of pedestrian presence along an expressway in USA. Photo: Hashemizadegan, A. (2014).

a limited area between SeyedKhandan Bridge and Resalat tunnel and Mosala and public urban open space improvement around Abbasabad governmental paradise about which there exists no data currently. Research method in this study is synthesizing the case as a kind of case study-combined strategy. So, Phenomenon has been surveyed in the following steps. First, Quality-oriented approach of landscape, landscape ecology of Forman, especially Kaplan's view point of everyday nature, definitions and principles of pedestrians and expressways design are inspected and analyzed. Second, study real cases and capture essential information that needs for understanding and research design through produce and use a template module of analysis which generated from previous step. Third, based on these findings and through using structure of produced template module of analysis, the study case area Pathology done and quality of related improvement of the case have been identified. Finally express findings and Indicators to identify the need for improvement (Table5) and some standard offer for this kind of design (Table6), which can be generalized to similar problems in other situations (transferability).

### Everyday nature

"City phenomenon consists of different layers of natural and synthetic systems and structures which form the city's final Qualitative overlapping. These systems are not separable, but in practice, planning and design, review, analysis and simplification of urban issues had to separate them from each other. One of these important layers is devoted to urban landscape which has a complex relationship with the city form (Taghvaei, 2012:148)." In this case, Landscape recognized as a dynamic phenomenon because it is the product of object and subject which perceived tangible and immediate. So, landscape affected by all layers of city and also affected them. In addition, "landscape architecture profession used visual arts, phytology, Society and psychology, art history, civil, environment and etc. to design open spaces for archiving three main purposes. These

goals are aesthetic, function and legible environment and cultural-identity" (Mansouri, 2004: 69). Based on this, concept and essence of landscape as one of the most important aspects of life quality must consider in any development plan. But, by promoting independent development of each of the indicators the overall quality of landscape must be preserved.

In Kaplan's view point, aforesaid quality-oriented layer is not characterized by its distance from human settlement (Included are places that range from tiny to quite large). Nor is a natural area necessarily one that is unaltered by human intervention. The focus is on the setting rather than the plants themselves. The emphasis is on the everyday, often unspectacular, natural environment that is, or ideally would be, nearby. Everyday nature includes parks and open spaces, street trees, vacant lots, and backyard gardens, as well as fields and forests which called. It is about the way the natural environment can foster well-being and can enhance people's ability to function effectively (Kaplan, et al, 1998:1). According to this definition, spaces and ways in cities or outside of it with which people live are substantial. This different idea supplement the past view of point which focused on parks and recreations fore restore physical and emotional relaxation on weekends. So if daily pedestrian trips along expressway's demand be accepted as a real phenomenon, the environment and corridor of this along is an example of everyday nature which is extremely ignored.

Kaplan intended to find basic patterns through noting aspects of everyday nature and then relying on them, studied the design and management of everyday nature relaxation principles. He committed to the notion that, although people are different in many important respects, they also have some shared needs. So he looks at some specific human characteristics that are central to the design and management of natural settings (Kaplan, et al, 1998: 5) which also can be the criteria for aesthetics. An important point here is that Central to the Kaplan's framework is the notion of information. So if The Environment is considered as a Source of Information, everyday

nature must be understandable. Understanding and exploring of the everyday nature can recover people from mental fatigue. Design and management efforts depend on the exchange of information (Sharing Information). The information exchange includes finding out about people's concerns as well as providing information to make their outdoor experiences satisfying. The information in an environment derives not only from its contents but also from its organization. On this assumption, contents like plants are also apart of place setting and these components organization appears in space, edge and etc. The understanding-and-exploration framework (preference matrix) as shown in Table 1, provides insight into the design and management of the everyday nature (Kaplan, et al, 1998: 16). Based on Kaplan's view point of everyday nature and preference matrix which suggests the quality of environment components and their organizing relationship for detailed designing, a daily short pedestrian trip along urban expressway should follow Table 1 qualities. In 2-d for understanding must consider Coherence and for exploration must consider complexity. In 3-d for understanding must consider legibility and for exploration must consider mystery.

**Landscape ecology**

Apart from what has been discussed above in everyday nature about well-being and ability to function effectively, setting components of everyday nature as a landscape is also related to sustainability and its ecosystem which according to Arne Naess view of point humans also is a part of that (Keller, 2009: 211). According to Forman, landscape as an ecology unit has 3 elements which are called patch, corridor,

and matrix (Forman & Gordon, 2008: 733). These elements create and support green infrastructures which increase biodiversity and Preserve and renew natural sources (Fig. 2)

In this context, one of the best opportunities to create a beneficial environmental corridor in cities is corridors along rivers and streams. Such environmental margins naturally attract and support a range of biodiversity (Mousavi, 2006: 44). This biodiversity can create and support an ecosystem which also acts like an indicator to show nature's sustainability and health. By a similar approach, urban expressways which usually have a large area and long length can be considered as corridor and take the role of a green one. With this background, what is important is the proportion of hard-scape to soft-scape and their proximity. However, pollution resulted from traffic on the expressway is a threat to the environment but in environmental concepts, expressway corridors like a river corridor can convert to a green corridor. Turning this threat into an opportunity causes improvement of city quality, pedestrian transportation and integrating green infrastructures (Niknam, 2008: 25; Inthasron, 2010: 18). So the ecological role of expressway corridors includes a large scale. Three topics of creating and supporting green matrix, increasing biodiversity and finally Restoring and protecting natural cycles (circulation of water, animal species needs and etc.) can be considered as ecological role of landscape along expressways (Fig. 3.). However

Table 1. Preference matrix. Source: Kaplan & et al., 1998:13.

	Undrestanding	Exploration
2-D	Coherence	Complexity
3-D	Legibility	Mystery

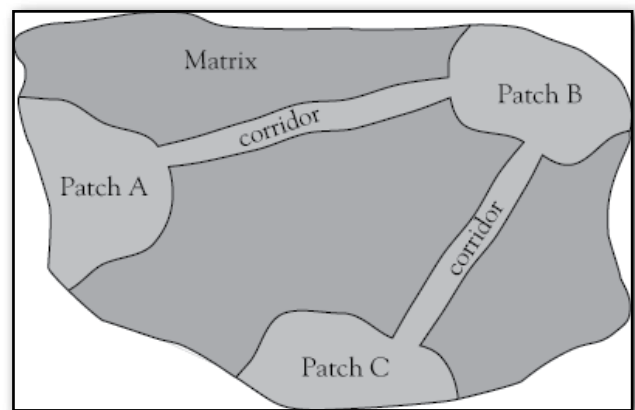


Fig. 2. Patch, corridor, matrix in landscape ecology. Source: Dhanapal, 2012.



Fig. 3. Examples of eco-paths crossing a highway. Using barriers and technological materials to inform the species to prevent accidents or provide certain types of conditions for their migration, and restoration of damaged circulation of dynamic ecological phenomena such as water circulation are some types which including news specialized topics to focus on. Source: OREG, 2010.

in small scales, moving away from roadway, using barriers and planting plants works as filters between pedestrian route, and makes it independent of expressway's side. The breathing air quality will also improve -Compared to current situation of expressway neighborhoods- for people who use public transportation and are usually stuck in heavy traffic, and specially who travel daily along sidewalks and unsecured informal paths along expressways. Fixing all the fundamental problems imposed by vehicles on the city, as well as producing green infrastructure and pedestrian improvements needs other plans by other disciplines, such as replacement of fossil fuels with clean fuels in vehicles.

### Walk and car ride

According to Knoflachner, more walkers make settlements more diverse and active while making them sustainable. Regarding this, pedestrian presence along expressways will increase a sense of security by fading addicts groups and drug dealers. Also the quality, safety and security of articulation of pedestrian with public transportation stations are very important for both of walkers and public transportation systems (Fallah Manshadi, et al, 2012: 25). It should be noted that improvements around transit stops increase pedestrian safety, comfort, and may also lead to increased transit ridership since most transit trips include a pedestrian trip at one or both ends (Khan, 2002:1). Therefore, the basis of planning and designing walking environments is to adjust vehicle behavior with human needs and restore the

lost security and safety of city against the invasion of vehicles (Pourjafar & Farbod, 2007: 54).

In this context, According to human physiology, walking has very low energy consumption, the average speed of walking is 1.4 m/s and under normal conditions there is a tendency to walk up to three kilometers. In addition, up to a 5 minute walk (400 meters) is completely normal and suitable for users to access public transportation stops (Hashemi, et al, 1995: 103,105; Knoflachner, 1994: 50).

Thus, safety, security, continuity, shortness, comfort, system integration, attraction and aesthetics are the planning and designing basis for pedestrian improvements (Mansouri, et al, 2012: 8; Hashemi, et al, 1996:5; Knoflachner, 1994: 50). The above objectives considered in high quality level; For example the feeling of safety on the streets is also a good indicator for understanding social respect. So the importance of pedestrian safety is beyond the damage caused by accidents.

The footway and pedestrian way are two main kinds of path for walking in Iran's road standards. Footway is located along and parallel to a roadway (also called sidewalks), but pedestrian ways are independent from roadways. Pedestrian connection is also a pedestrian way (Hashemi, et al, 1996: 1). This article studies pedestrian ways along areas of expressway corridors (pedestrian connection); and also will follow any further action like removing sidewalk gaps which is related to pedestrian connection plan. To this end, basic definitions of the roadway should also be given.

Movement, access and social activities are three main aspects of urban roadways which are the basis of Arterial, collector and local classification (Hashemi, et al, 1995:8). Based on standards, movement is the main aspect of arterial roads, to which access and social aspects adjust. By applying different levels of access to arterial roads, it can be divided to highway, expressway and street (Hashemi, et al, 1995:10). By definitions, the main difference between highway and expressway is that the highway has no level crossing, entrance and exits are limited and usually built outside the cities. Unlike highways, the expressways have level crossing, railways and pedestrian crosswalks and also The speed limit is higher (Iran's traffic code, 2005: 1, 4, 15, 52). According to definitions, however, the presence of pedestrians along urban expressways has its proponents and opponents. The opponents rely on that in most parts of expressways, car speeds are high and like freeways, controlling cars is dangerous. Pedestrians are therefore prohibited (Szoboszaly, 2007). Besides, it must be admitted that expressway construction today cannot solve the problems of transportation well and remain truly alone. Because of heavy traffic on urban expressways especially at the beginning and end of official working hours, movement in city actually has too much cost, time wasting and a lot of mental and health disturbances for citizens (Pourjafar and Farzbod, 2007: 53).

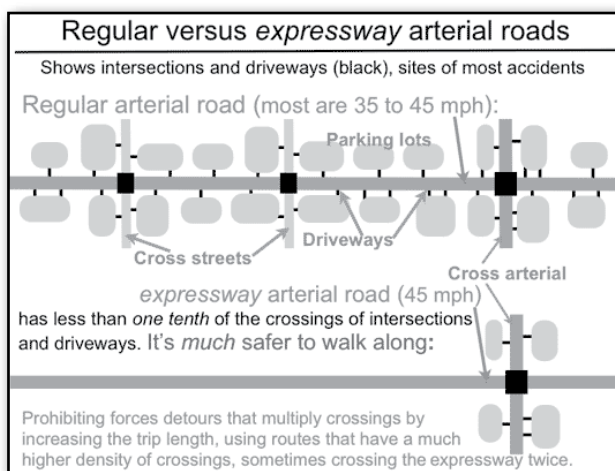


Fig. 4. Regular versus expressway arterial roads. Three attributes which make expressways, express. Source: MTS, 2007.

Proponents who argue to support the presence of a pedestrian along expressways include the following topics:

The meaning of “express” in expressways. The fundamental problem. Origins of Pedestrian prohibition on expressways. Comparison of where pedestrians walk. Safety and “Complete streets”.

As top proponents, such as American modern transit society Inc. expressed, Expressways are arterial roads that have few intersections (1/5 as many, on average, for the same distance), almost no driveways, and no parked cars. These three attributes make the expressways the safest roads to walk and ride bicycles. These attributes also make them “express,” decreasing travel times without increasing speeds (Fig. 4).

The fundamental problem is about hierarchical street pattern forces using arterial roads, which include expressways. Prior street patterns were laid out in a rectangular grid pattern. If a street was blocked for construction or other reason, the pedestrians merely had to walk one block, and then proceed on their way. After this period, the streets were laid out in winding, random and intermittent street patterns. The purpose was to discourage cars from traveling on secondary streets and encourage them to use arterials, including expressways.

The effect that a detour designed for the car user has on pedestrians and transit patrons was never considered. A detour designed to take a car user an extra 2 minutes for choosing to travel on secondary streets is equivalent to a 20 minute detour for pedestrian (Table 5); (Fig. 5).

Expressway intersections, like arterial intersections, are the most dangerous part of the roadway because most accidents occur there. Pedestrians are already allowed at all intersections, so dangerous intersections cannot be an excuse to ban pedestrians from walking along the shoulders. Intersections must be made safer.

As mentioned earlier, detours are made for streets with 5 times more intersections per mile, on average. The number of intersections is further multiplied by



Fig. 5. Right, historical rectangular grid pattern. Mid, new random and intermittent street patterns. Left, example of detours which if existed is too long and adds time to trip. Source: MTS, 2007.

the factor that the trip length was increased. So for example it may make 10 times more intersections. These detours would actually increase the danger to pedestrians because of cars driving across sidewalks to get to parking lots, which forces pedestrians to walk in the lane of car traffic and increases trip length and exposure to traffic.

Adopted in 2003, the Comprehensive County Expressway Planning Study provides a long-term plan for the improvement and maintenance of the County Expressway System. The 2003 Pedestrian Element supported that policy by proposing improvements for two different pedestrian needs: traveling along the expressways and crossing the expressways. During the 2003 process, city and community input focused mostly on facilitating safe pedestrian crossings of the expressway.

For traveling along the expressways, a list of new sidewalk locations was developed to close gaps in otherwise continuous sidewalks, to access transit stops, and to provide access to land uses fronting on the expressways. The 2003 Element also recommended improved connections and directional signage to parallel pedestrian facilities, such as trails and frontage roads.

The 2008 Update has taken a more proactive pedestrian route planning approach with the

following goal: To identify continuous routes, either in the right-of-way or along alternate parallel routes, providing for pedestrian travel ideally along both sides of the expressways. The 2008 Update Pedestrian Element completely replaces the 2003 Expressway Study Pedestrian Element, including all policies, project lists, and recommendations. In this report to identify the paths, the following steps have been taken.

a- County and city staff met to develop initial pedestrian route maps and gather information on implementation opportunities;

b- Extensive field review of all 164 miles of roadway frontage was conducted

c- The preliminary pedestrian route maps were presented to the Technical Working Group and the County/VTA Bicycle and Pedestrian Advisory Committee (BPAC) for review and comment (Fig. 6). A separate Pedestrian Element Working Paper is available that includes a detailed map for each roadway. The continuous routes use the following three types of facilities.

First, Existing sidewalks on the expressway. Second, Parallel routes outside the expressway right-of-way. Parallel routes are within a convenient distance of the expressway and consist of creek trails, park pathways, frontage roads, and parallel city streets.



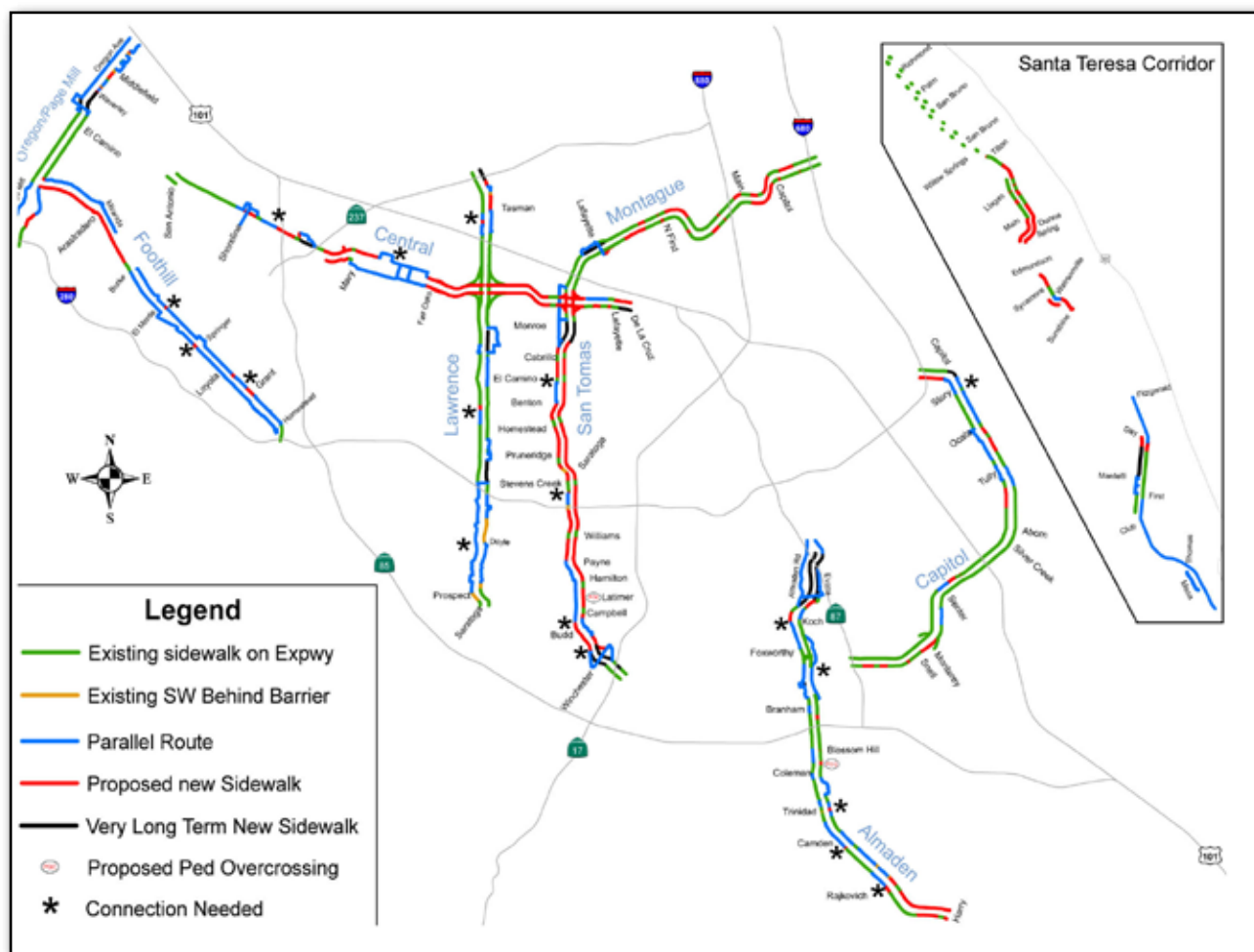


Fig. 6. County of Santa Clara 2003 Comprehensive County Expressway Planning Study and the 2008 Updates the continuous pedestrian route plans for the eight expressways and Santa Teresa-Hale Corridor in a countywide map. Source: www.sccgov.org.

Routes are not designated through non-County/city property even if they are open to public use (e.g., shopping centers, parking lots, schools). It has also been noted that some creek trails and park paths are only open from sunrise to sunset. It is not anticipated that this will be a great hindrance to pedestrian travel along the expressways as most pedestrian use occurs during the day. Third, Recommended new sidewalk locations on the expressway, including Very Long Term. Very long term sidewalks are recommended in areas designated as hard spots. These are locations where physical constraints limit available space and alternate routes are not apparent or are inconvenient. Specifically, a location was designated a hard spot if it met the following conditions. No usable space is available behind the curb; no lane or shoulder reduction is possible; no refuge

reduction/relocation is possible; and no convenient parallel route is available. It is important to know that certain locations along the expressways corridor face unique situations where it would be undesirable to provide sidewalks, even in the very long term. For example these areas are as follows; where there are no pedestrian destinations or bus stops along the expressway, providing a sidewalk would have pedestrians a temptation to jump over the fence as a shortcut to reach destinations on the other side of the tracks, an area that operates like a freeway and etc. From the technical point of view, three issues of sound walls, landscaping with vegetation and lighting along expressway is of significant importance. Studies regarding sound barriers examining several conditions and their costs, shows that the priority

is the restoration of old ones while building new ones is a long-term plan. A basic landscaping in the expressways corridor and removing interruptions is required as a minimum. Basic landscaping refers to limited use of tree planting, bushes and grass on the sound barrier to improve the refuge and facilitate automatic irrigation system. According to this and also the cost of maintenance and high water consumption, vegetation is planted only at specific points in the form of a holistic program. In other areas where there are only visual values, new approaches are suggested such as using dry landscaping. Until 2003, due to the high cost of lighting, only in intersections and landmarks, lighting was provided exclusively for drivers. So it was a question of low lighting in expressway regulations because they disturb the surrounding houses. Since 2008, in line with the theme of walking along the expressway, lighting is also important in human scale. Use of green renewable energy could reduce costs.

Today, to organize, promote and implement ongoing changes and the needs of integrating infrastructure and open space design, specialized groups are defined. One of the most experienced of such groups is California's transportation landscape architecture which is called Caltrans. Responsibility and goal of this group is to set and make a comfortable journey and a pleasant visual experience for all those who live in California, work or travel through the integration and unification of the transport facilities. The experiences of case studies

There are several instances that can show a variety of solutions for presence of pedestrians along the expressways. Accordingly, in accordance with the needs of the study and due to case relevance with aspects of this project, through template model (Fig. 7) fourteen cases have been analyzed in general level and three cases have been analyzed in detailed level (Table 2); (Fig. 8, 9).

Such improvements are at least about 4 hectares and have a length of about 1/7 km (20 minutes walk). In improvement projects, ranging from 20% to 40% of area are occupied by paths, between 50% to 70% by

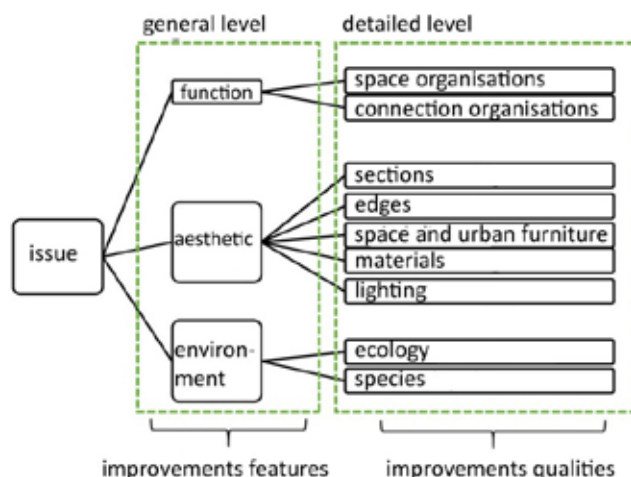


Fig. 7. The search template model for case studies. Source: authors.

green spaces, between 1% to 4% by refuge, between 1% to 10% by services and between 2% to 6% by entertainment spaces. On average, per kilometer they have a service activity which is sometimes as a station and sometimes as a core. Recreational activities include landscaping and views that serves a variety of awareness on the move. Activities organized along the expressways are sensitive to their neighbors and their productivity and reaction is in close contact with the urban context.

Fig. 8. Up right, expressway removal for pedestrian improvement and ecological gardening through covered up the road in Spain. Up left, B.R.T. special overpass with multipurpose stations in china. Down left, overpass along urban expressway in Korea. Down right, improve pedestrian and reduce visual disturbance along capitol expressway in America. Source: <http://www.landzine.com>.

Fig. 9. An example of a detailed analysis of the cases. A part of the Paths interference analysis along Australia Southern expressway. Source: authors.

The distance of continuous routes is from 0/75 km to 2/74 km. 30% of the total road's area is exclusively for walk. 45% of paths for walking are designed as sidewalks and the rest in other forms. If the track is a combination of different levels, vertical connections are intended every about 200 meters (4.2 minutes). Pedestrian have linear geometry with smooth curves.

Table 2. global and Iran's experiences which studied with this research template model. Source: authors.

category	label	country	City location	discipline	Length(km)
Pedestrian connection	High line	USA	Within the city	Landscape architecture	1/6
	Balboa park station pedestrian connection and bicycle	USA	Downtown with heavy traffic	Landscape architecture	1
	Chamran expressway sidewalk (Tehran)	Iran	North edge of city	Civil and transportation	2
	Pedestrian between to residential town beside sheikh Fazlollah expressway(Tehran)	Iran	suburb	Parks and green spaces	1/9
Freeway-expressway removal	Cheonggyecheon expressway	Korea	Downtown, located on Seasonal river	Landscape architecture	5/79
	San Francisco Central Freeway	USA	Border of the city and the coastal edge	Landscape architecture	1/6
	Madrid RIO	Spain	The old city center near the river	Landscape architecture	6
	YadegarEmam expressway's Pedestrian and bicycle improvement (Tehran)	Iran	Old Town residential area	Urban design	1/7
T.O.D., pedestrian improvement and gap analysis	Curitiba	Brazil	downtown	Urban planning	Urban scale
	Capitol expressway light rail and pedestrian improvement	USA	Residential suburbs	Civil and transportation	3/8
	San Francisco costal trail	USA	Within, edge and out of city	Regional planning	804
Pedestrian along expressway	Long Sleeve Skywalk	china	Within the city	Landscape architecture	0/63
	Southern duplication expressway	Australia	City edge	Landscape architecture	Urban scale
	Chamran expressway's pedestrian (shiraz)	Iran	located on Seasonal river	Landscape architecture	3



Fig. 8. Up right, expressway removal for pedestrian improvement and ecological gardening through covered up the road in Spain. Up left, B.R.T. special overpass with multipurpose stations in china. Down left, overpass along urban expressway in Korea. Down right, improve pedestrian and reduce visual disturbance along capitol expressway in America. Source: <http://www.landzine.com>.

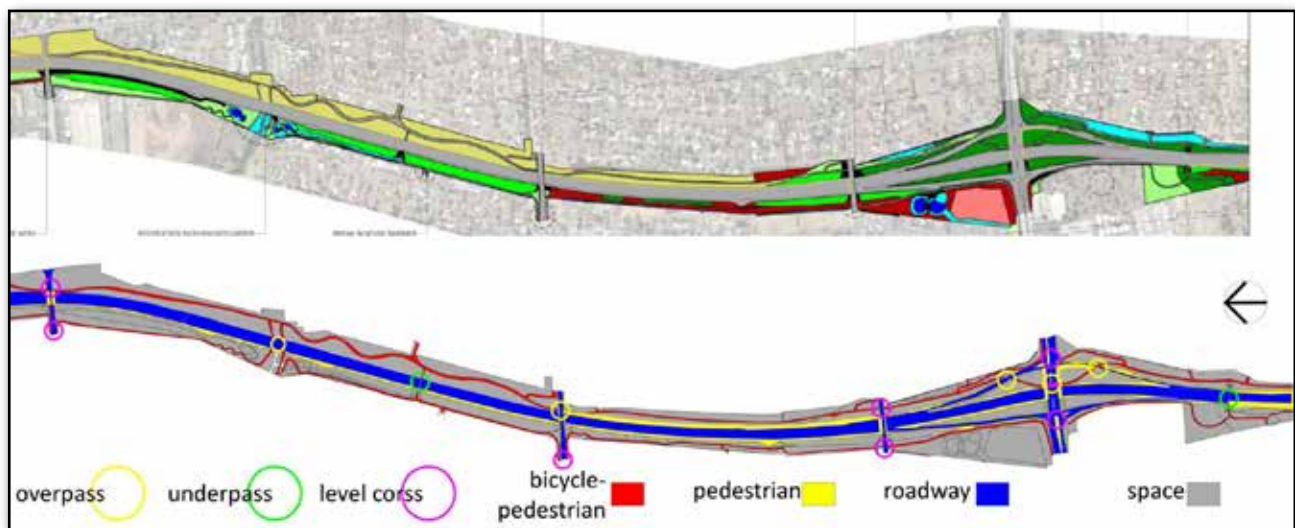


Fig. 9. An example of a detailed analysis of the cases. A part of the Paths interference analysis along Australia Southern expressway. Source: authors.

Aesthetic qualities are on three main topics. The first is to eliminate or reduce fearful factors into preferred things. In this regard, the quantitative aspects about anthropometric and ergonomic and the qualitative aspect is related to using simple forms and arrangements to understand and explore environment, while also having a certain degree of the mystery.

The second is about legibility and navigation. In this regard, the quantitative actions is related to such topics as the use of Signs and symptoms and qualitative actions is related to techniques such as the Ten Kevin Lynch 's form quality.

The third is about making the space rich and provide mental relaxation and emotional conditions. Actions in this context, from quantitative aspects are related to aspect ratio, distances and privacy; and from qualitative aspects related to variety of materials, domination, depth, openings and the points of interest.

Ecologically 55% of the land is softscape which composed from 98% plants and 2% water. 40% of the vegetation is also special kind and the rest are native plants with organic cultivation system. Designing water has both role of resources management and aesthetic. Area and distribution of softscapes appropriate to their role patch, corridor and matrix

structure. At least 150 unique plant species used in planting. In this planting, some needs of ecosystems, sustainability and the richness has been considered

### The studied area

The studied area is located at the intersection of historic and green axes of Tehran which is in border of regions 3, 6 and 7 of Tehran municipality. The area is along Resalat expressway with a length of 1/7 km between Beihaghi and Seyed Khandan terminals. This area contains some Index of population and activities such as Abasabad lands, Mosala, Madran Park, residential and Administrative areas and also crowded daily coming and going cores like Beihaghi Terminals, Seyed Khandan Terminal and Mosala metro station (Fig. 10). The topography of the area is divided into fifteen terraces. These terraces have a major role in the direction and management of water resources, Visual dominance, movement interferences and the micro climate.

From total of 328,526 square meters which have been identified, 43/52% are occupied by connections and 56/48% are occupied by activities. Of those regarding ownership of land, the highest area of land is owned by the state, municipalities and the private sector. For Ecological goals 61/48% of areas used for hardscape and 38/52% of it used for softscape.



Fig. 10. The studied area. Source: authors.

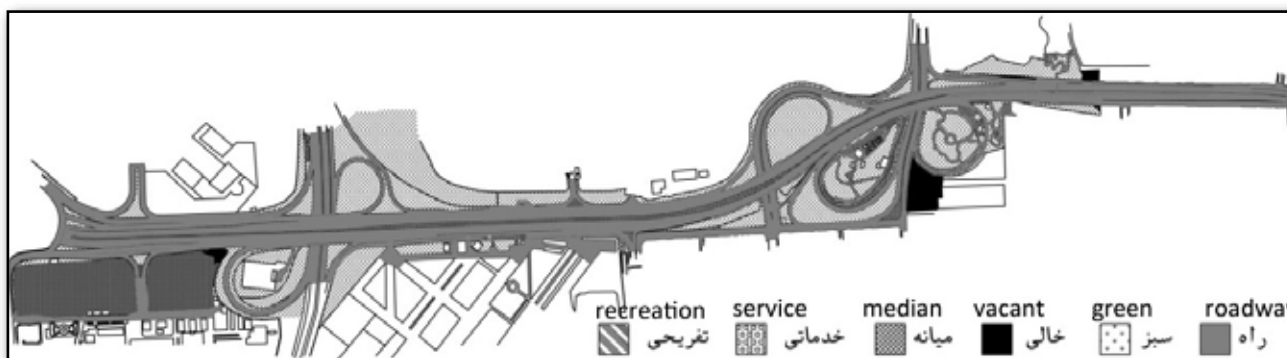


Fig. 11. Juxtaposition of activities along studied corridor area. Source: authors.

According to the activity organizations (Fig. 11) and the results of interviews of 30 users (Table 3), three categories, including transport core, large activity core and small activity core have been defined. Then, according to these categories people, moving objects and their trajectory are shown as a graph of relations and movement pattern of walking and public transport movement (Fig. 12).

The movement patterns were found and highlighted based on drawing of walking routes then numerous diagrams, including normal and public routes, car traffic, roadway types and their speed limit, footway types and their status, the overpasses and bridges and other facilities were drawn. According to these Regulations, 3 status types as “non-standard”, “with problem” and “good” were detected

(Fig. 13). Route Interference analysis identified 23 unsafe and “lacking pedestrian comfort consideration” intersections (which cause a lack of continuous walk) and five overlapping positions (where pedestrians entered into the roadway boundary) along the expressway (Fig. 14).

Integrated analysis based on recent information has divided the whole studied area to 3 main regions and 7 zones which create three main sub-trips and a longer daily pedestrian route (Fig. 15).

Comparative analysis of data from case studies, standards and indications of studied area shows that if along an expressway, phenomena such as two large terminals (Bihaghi terminals and Seyed Khandan terminal), a small terminal (Mosala metro, bus and taxi station), two Taxi station and BRT (Madaran

Table 3. main questions, properties and responses which taken through the interview. Source: authors.

why not used the car?	do you have a car?	is there a shortage on the way?	What is hateful?	What is joyful?	What is your travel route?	How many days a week do you take this route?	What is your educational level?	age	gender	row
heavy traffic	yes	no	Width low	green space	Mosala - Argentina St.	6	Bachelor	42	male	1
dislike	no	traffic police	Uneven walk	nothing	Mosala - Argentina St.	6	illiterate	31	male	2
dislike	no	police & green	snow	green space	Mosala - Argentina St.	6	Bachelor	28	male	3
Fatigue driving-traffic	yes	market	nothing	nothing	Mosala - Argentina St.	rarely	Bachelor	25	male	4
Legal restrictions-parking	yes	no	Width low	lack of traffic	Mosala - Argentina St.	6	Bachelor	22	male	5
Legal restrictions-parking	yes	stop comfort	nothing	nothing	Mosala - Argentina St.	3	Bachelor	25	male	6
Legal restrictions-parking	yes	stop comfort	nothing	nothing	Mosala - Pakistan St.	6	Bachelor	41	female	7
heavy traffic	yes	no	no sidewalk	nothing	Mosala - Nilufar St.	6	Bachelor	32	male	8
heavy traffic	yes	no	no sidewalk	nothing	Mosala - Nilufar St.	6	Associate	25	male	9
heavy traffic	yes	stop comfort	snow	nothing	Mosala - Nilufar St.	6	Bachelor	45	female	10
Fuel prices	yes	sign lack	no sidewalk	nothing	Mosala - Nilufar St.	rarely	Bachelor	52	male	11
Fatigue driving-traffic	yes	no	Width low	nothing	Mosala - Nilufar St.	3	Master	33	male	12
Legal restrictions-parking	yes	no	no sidewalk	nothing	Mosala - Nilufar St.	3	Bachelor	33	male	13
Fuel prices	yes	police	nothing	green space	Nilufar St. - Park	3	Bachelor	36	female	14
dislike	no	no	Width low	green space	Nilufar St. - Park	6	Associate	20	male	15
Fatigue driving-traffic	yes	no	car conflict	not crowded	Nilufar St. - Park	6	Bachelor	22	female	16
dislike	no	no	nothing	green space	Nilufar St. - Park	3	Associate	27	male	17
dislike	no	w.c.	nothing	nothing	Nilufar St. - Argentina St.	6	Bachelor	29	male	18
heavy traffic	yes	stop comfort	nothing	nothing	Nilufar St. - Argentina St.	3	Bachelor	43	male	19
dislike	no	no	nothing	green space	Nilufar St. - Argentina St.	6	Bachelor	35	female	20
Legal restrictions-parking	yes	stop comfort	nothing	be close	Nilufar St. - Argentina St.	6	Bachelor	24	female	21
Legal restrictions-parking	yes	market	nothing	nothing	Nilufar St. - Argentina St.	3	Bachelor	28	male	22
be close	yes	no	nothing	green space	Local - madaran station	rarely	Bachelor	22	male	23
be close	yes	no	rain	green space	Local - madaran station	6	Bachelor	25	female	24
be close	yes	stop comfort	nothing	nothing	Local - madaran station	3	Master	44	male	25
B.R.T.	yes	stop comfort	nothing	not crowded	Local - madaran station	6	Bachelor	36	male	26
be close	yes	Crosslinking	rain & snow	nothing	Beiaghgi station- mostazafan	3	Bachelor	32	male	27
dislike	no	Crosslinking	nothing	nothing	Africa St.- Mosala	6	Associate	26	female	28
heavy traffic	yes	awning	Width low	nothing	Africa St.- Argentina St.	6	Bachelor	32	female	29
be close	yes	no	Uneven walk	not crowded	Flower Exhibition - Local	rarely	Bachelor	40	male	30

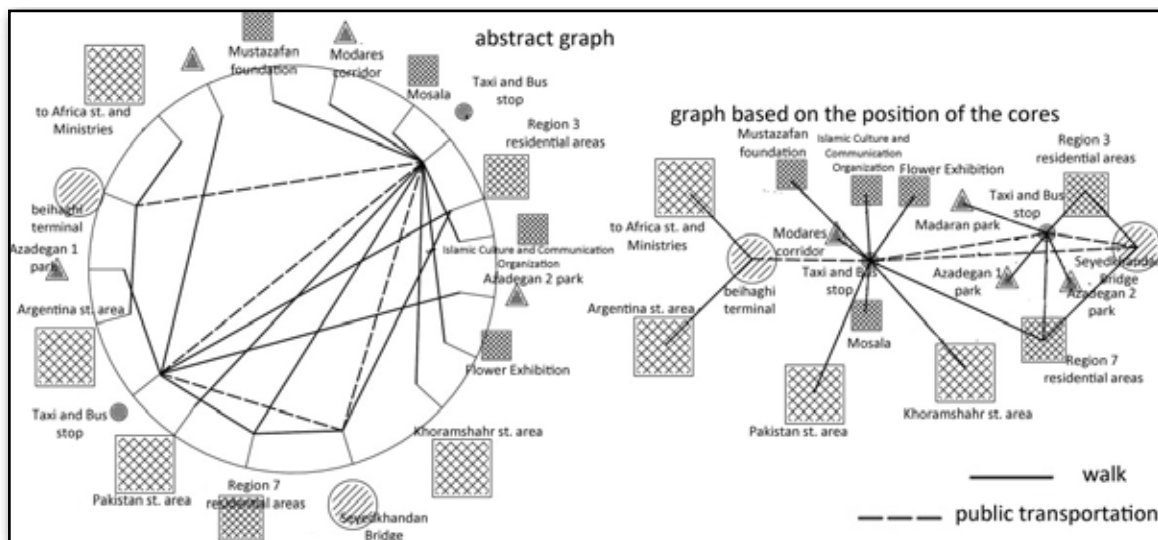


Fig. 12. The graph of relations and movement pattern in the along studied area corridor. Source: authors.

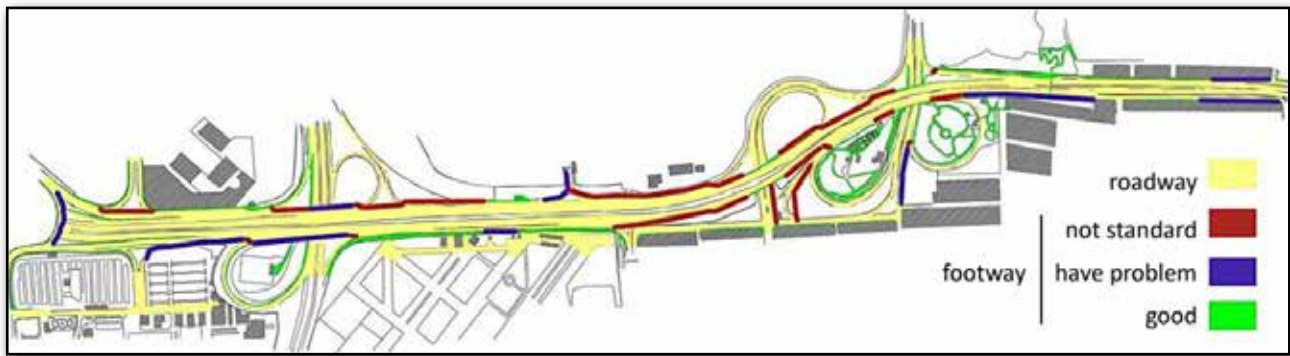


Fig. 13. Existing footways quality assessment along studied area corridor. Source: authors.

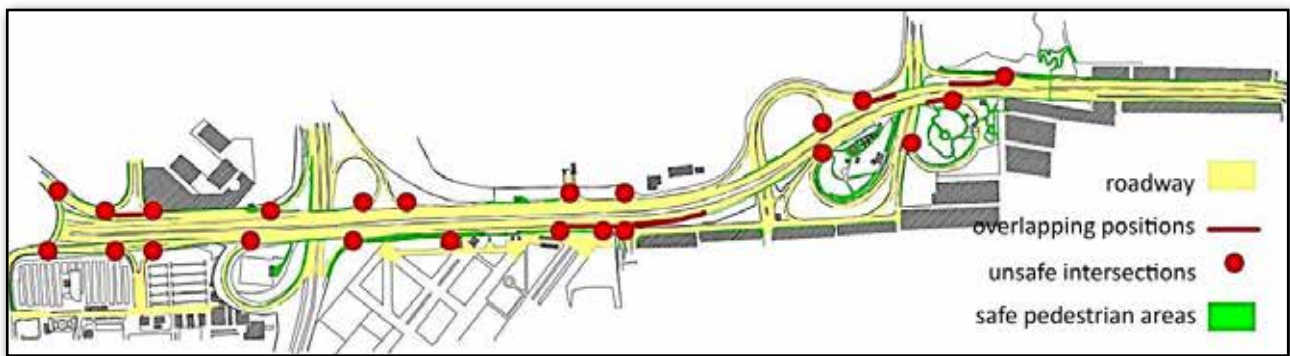


Fig. 14. Paths interference qualification along studied area corridor. Source: authors.

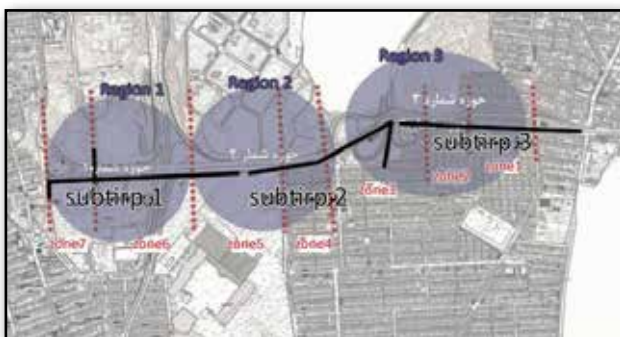


Fig. 15. Identified regions and high demand sub trips which create the whole longer daily pedestrian route of studied area. Source: authors.

Park), 3 important urban context (Argentina, Shariati, Khoramshahr), two important activities (governmental paradise, Sadra Islamic culture center), two landmarks (Abbas Abad lands, Tehran Mosala), a major urban green area and numerous parks and green corridors, heavy car traffic, lack of footways and alternative parallel route and evidence of high demand travel despite of unsafe walking conditions exist, then the need and the possibility of pedestrian improvement as an everyday nature

is needed. This daily travel demand shouldn't be dropped and while it cannot be prevented, should use the corridor as well as the proper implementation of transport.

In this regard, according to the SWOT analysis, despite the good potential to improve pedestrian in studied corridor, we must pay to fix the following failures:

- Functional: extreme proximity to the expressway, multiple interferences of footway and roadway, no clear path for pedestrians, low width, physical and visual barriers, lack of continuity, the length of the track.
  - Aesthetics: of insecurity, crime and urban vandalism, poor quality of the pedestrians in the face of weather conditions, weakness in preference matrix of everyday nature (mental relaxation).
  - Environmental: Environmental pollution
- Accordingly, to solve problems, commensurate with three divided areas (Fig. 15) to achieve three main priorities: 1) elimination of motorcycle noise and increased safety, 2) identify upgrades and

view and 3) provide the required levels of activity and eliminate disruptions, the flowing actions have been suggested. Connecting green spots, offering pedestrian bridges in high-risk areas in terms of visual impact assessment, creating multi-functional facilities such as integrating of overpass cross, taxi station, BRT, Views and utilities and combination of the bridge, parallel route, new pedestrian, park ways and etc. (Fig. 16);( Table 4).

The geometry of suggested path follows safety, speed and pedestrian's outdoor needs which is proposed along expressway corridor. Sidewalk and bridge have only been used in hard spots, according to vehicle speed, driving control and traffic conditions. This contains three trips with length from 0/15 km to 0/75 km. specific views such as Mosallah, northern mountains and examples of Tehran's urban development visions are considered in track design. Each point of view provides a unique vision that is not already feasible in real life. These visions are congruent to Kaplan's preference matrix

for everyday nature. The foregoing qualities are like those that exist in Tabiat Bridge and Highline, but the difference is that the design template is intended for transportation and journey with urban daily quality rather than for outing in free times.

There are some attractive parks in the expressway corridor, but few people know their presence, and even few drivers realize the artificial waterfall and cave stretching from the west to the east side of the expressway before Haghani Exit. This route could increase the ratio of soft materials by passing through the parks and getting them connected with green space and planting on their way, playing the role of a corridor in the green matrix by connecting the spots, moreover it could convert the neglected island parks to an everyday highly-demanded path (Fig. 17).

Due to biological diversity and number of plant species, the current status is appropriate and there is a need for at least 10% increase in soft space with respect to the ratio of soft-to-hard materials in this area; this has turned barren lands into green lands and

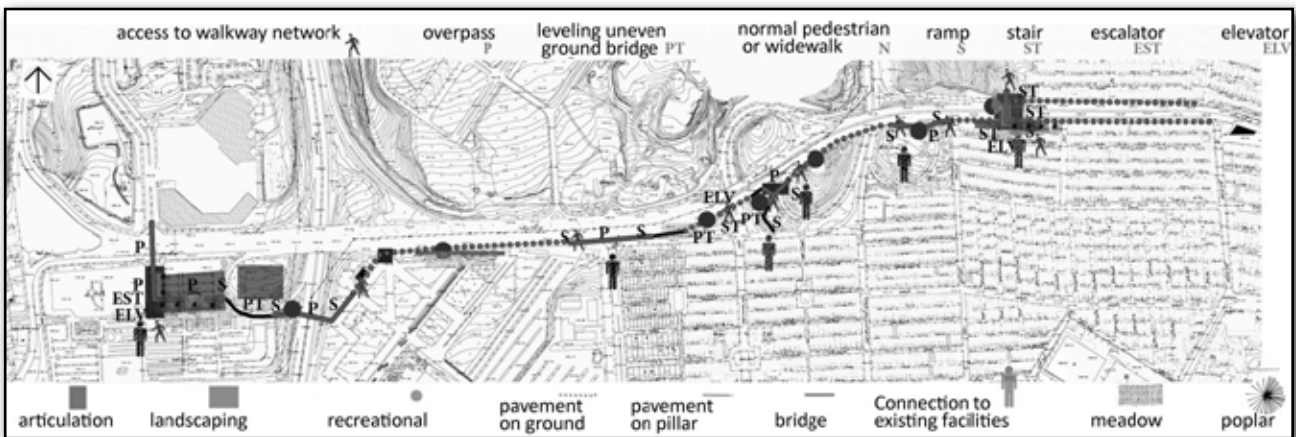


Fig. 16. Final connecting- activity organizing proposed diagram. Source: authors.

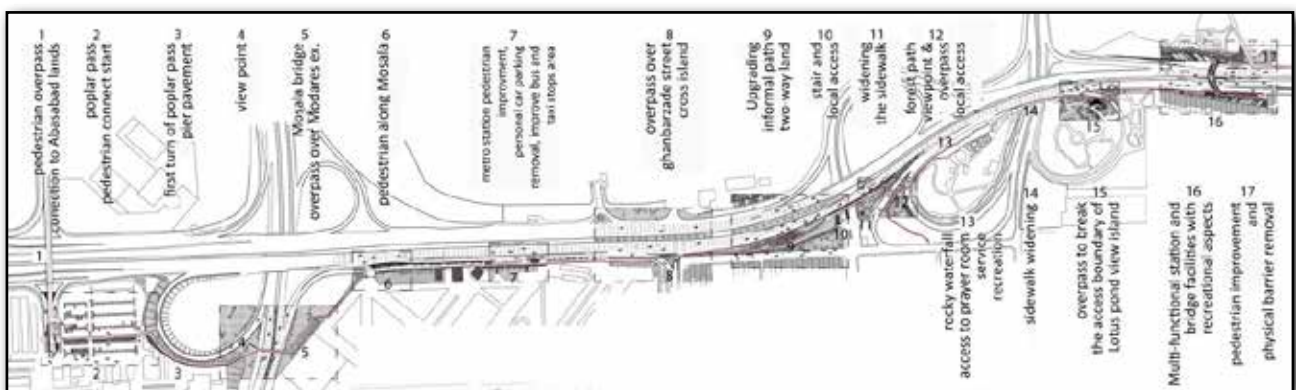


Fig. 17. master plan of the proposed pedestrian project. Source: authors.



Table 4. A concise summary of the proposed program. Source: authors.

	category	type	Experience, theory and case study	status quo	comparison	
function	space organization	A	At least 4 Hectare	32/8 hectare	have ecological role	
			recreational: 2% of whole	recreational: 0/97% of whole	Recreational increase	
			service: in each kilometer	service: from 0/97km to 1/5 km	decrease distance of services	
			green open space: 50% of whole	green open space: 35/43% of whole	green open spaceincrease	
			...	...	...	
	connection organization	B	recreational is landscape and views	recreational:landscape and social	viewpoint increase	
			...	...	...	
			Total travel time is 20min (1/7 km)	Total travel time is 20min (1/7 km)	sub trips from 0/15 to 0/75km	
			roads: 4% of whole	roads: 43/53% of whole	ok	
			footways: 30% of roads	footways: 14/55% of roads	increase	
aesthetics	section	A	pedestrian hight mastery	dominance Walk Failure	domination and character	
			...	...	...	
			B	skyline preserve	Visual pollution of power lines	remove Visual pollution
				...	...	...
				...	...	...
	edge	A	the edge of the path is clear	not found	in favor of pedestrian	
			...	...	...	
	material	B	Materials are part of the identity.	Turbulence in pavement	use for create Identity and unity	
			...	...	...	
	space and urban furniture	B	thought-out and detailed selections	Number of furniture is appropriate only in parks.	master planning	
anthropometric and ergonomic paramerts			In parks; in accordance with activity( like play chess,picnic and etc.)	attention to anthropometric and ergonomic paramerts		
lighting		A	...	roadway lighting poles: every 50 meters	care for visual and physical barriers	
			roadway lighting poles: every 50 meters	...	...	
lighting	B	...	there is no Lighting Concept Plan	Due to a major idea.		
		Lighting Concept Plan	...	...		
environment	ecology	A	...	softsace: 38/53% of whole	increase	
			softsace: 55% of whole	vegetation: 98/5% of softscape	ok	
			vegetation: 98% of softscape	...	...	
	species	B	...	both of resources management and aesthetic in primitive level	Upgrade to more advanced levels	
			both role of resources management and aesthetic	...	...	
			...	...	...	
species	A	...	more than 150 species	Preserved		
		more than 150 species	there is no concept or plan	Due to a major idea.		
species	B	biological cycle of species	...	...		
		...	...	...		

qualitative= A      quantitative= B

planting in the second level of paths and Beihaghi Parking. Overpasses and paths built such as piers, allow water to pass which is then absorbed by the ground. The ecologic role, which is expected of this path, can contribute to the conversion of hard to soft

materials along corridors in order to complement and enhance the green matrix at large scale and to improve breathing airflow through keeping away from roadway and making provisions for plant species in the middle.

## Conclusion

Due to structural changes in lifestyle, urban expressway is considered an everyday nature to pedestrians all along the way, which despite public belief is a good opportunity for promoting the quality of short daily pedestrian trip. Low levels of pedestrian and driver interference and intersections - which are the main cause of threat and difficulty in the travelling of pedestrians, is very limited along expressway. Pedestrian-focused expressway design is implemented under the supervision of institutions such as Caltrans, in addition to other special circumstances along expressways. Part of the duty of the institutions, at city level, can be to integrate technical and traffic unit tasks, green space, and beautification of municipality prevalent in Iran.

Research shows that there are special conditions along Resalat expressway, the section between Beihaghi Terminal and SeyedKhandan, where citizens' moving on foot along the expressway is considered a normal fact. Likewise, although there are a number of taxi and bus stations, but it serves little function due to the spatial quality and lack of smoothness in the pedestrian path during rush hours. The significance of the pathway and high demand for trips are due to the heavy traffic of the foregoing roadway line, traffic congestion, and long queues of public transportation vehicles, trip cost, and relatively short path, which call for urgent attention as a result of the desire to pedestrianism and lack of alternative pedestrian pathway.

Investigations also indicated that until now efforts were mostly made to facilitate and secure expressway crossing and to build sidewalks at best. In the meantime, this important line can serve as a considerable example in public transportation and urban health. The proposed sidewalks within 15 minute time travel can play a crucial role in promoting safety, comfort, and position of passengers in the course of short urban trips, as well as increasing the level of the use of urban transport systems (Fig. 18). The following detailed measures are recommended for building the foregoing sidewalk:

- Functional

- Use of cloverleaf interchange, sidewalks of roadway bridges and other facilities (buffets, WC, pray house, etc.) in order to make a balance in case of multi-faceted requirements of pedestrian-move path.



Fig. 18. 3D simulation samples of proposed pedestrian improvement. Source: authors.

- Use of new pedestrian or parallel route in wide sites in order to shorten and secure path.
- Use of air routes (overpass) in narrow, dangerous and conflicting sites.
- Multi-functional, centralized and combined use of facilities such as cross bridge and bus station.
- Utilization of the interview results for identifying the destination of trips
- Aesthetics
  - Converting urban-aerial facilities including power line transfer to underground systems
  - Considering the visual impacts of bridges on landscape and environment and their construction as much as possible just along expressway.
  - Forming geometry of path according to the main idea of overpass (long bridge) with a short-track priority, target location and needs of preference matrix.
  - Utilization of the interview results for identifying priority points.
- Environmental
  - Connecting available green spaces (Madaran Park, Azadegan Parks, cloverleaf interchanges, etc.) to one another as green spots through building and reinforcing green corridor.
  - Providing 50% of soft materials (softscape) and 50% of hard materials (hardscape by measures such as converting a barren land into a green land and making two-level paths and parking for providing the possibility of planting
  - Preserving the diversity of plant species through a system of targeted planting.
  - Putting effort into the management of surface water and water consumption in planting species, preserving and using them locally with regard to aesthetic perspectives rather than simply technical-mechanical needs.

Criteria obtained during this study were developed in order to identify districts with similar problems and criteria for how to improve them in Tables 5 and 6. The results of the investigation indicated that it will be necessary to renovate daily footway if terms stipulated in Table 5 are mostly met along expressway. Moreover, the most important criteria put forward and developed directly according to this research along the expressway can serve as indicators for how to perform renovation of urban expressway in metropolises such as Tehran. This was also developed in Table 6 in detail, which can be used as the ultimate achievement of the research in line with the proponents of people presence along expressway in compliance with conditions regarding it

Table 5. Criterion and indicator for identifying the needs of pedestrian improvement along expressway. Source: authors.

row	Criteria	Indicator
1	Density of activity centers along expressway	At least two important urban neighborhood
2	Density of transportation nuclei along expressway	At least two important urban terminals
3	Certain urban areas, landmarks	The presence of at least one specific project on suburban or urban scale
4	Target distances	Short trips less than 1 km
5	Evidence from trip demand	Lack of official path and alternative parallel path
6	Ecologic reserve	Multiplicity of parks along and next to corridor. Have big green zone.
7	Heavy bottleneck traffic	Sudden presence of pedestrian population in roadway, connection of multiple tracks in one track
8	Potential for daily landscape promotion	Presence of certain natural side effects

Table 6. the most important criteria for guiding how design pedestrian improvements along expressways. Source: authors.

Functional	Space- activity	quantitative	40% roadways, 50% green, 4% service, 2% recreation, 4% others
		qualitative	Recreational spaces limited to landscaping and viewpoints, service spaces as station at least per kilometer
	Path-connection	quantitative	Trips almost 1/7 km (20 min), 70% share of roadway and 30% footway, half as sidewalk and half as other forms, in aerial multi-level tracks per 200 km (2/4 min) need for connection
		qualitative	Interfering analyses of various transportation system, focus on everyday and local passengers, prevention from assumed trails
Aesthetics of elements (materials, furniture, lighting, etc.) and element interrelationship (section, edge, space, etc.)	Concern and priority	quantitative	Physical dimensions fit for human physiology and mind
		qualitative	Paying attention to comprehensible and relationship between simplicity and mystery
	Legibility and navigation	quantitative	Paying attention to signs and maps
		qualitative	Paying attention to items such as lynch's ten qualities of form
	Space enrichment	quantitative	Three-dimensional ratios determining space largeness and smallness
		qualitative	Topics such as sense and perception with the aim of taking visual (other sensual) and mental pleasure
Environment	ecology	quantitative	At least 4 hectare earmarked for important ecologic effect, 55% level of soft materials
		qualitative	Paying attention to distribution of soft materials and role in green matrix
	Planting species	quantitative	Plant diversity of at least 150 species
		qualitative	Paying attention to planting hierarchy, as well as water management

as an opportunity. It should be noted that trip demand as an existing fact can be left without investigation, obstructed, or promoted through improvement as an opportunity. The last approach is a certain kind recognized by integrating infrastructure with the open space design in landscape architecture, which attempts to match urban needs to new circumstances with a holistic viewpoint aimed at promoting daily urban landscape (quality of daily natural life) and assuming a role in the ecological urban matrix.

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