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Storage Spaces (Neighborhoods), Residential Case Study: Naeem Abad Streets of Yazd, Iran

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ABSTRACT: During recent decades, in order to enhance the citizens' presence in urban areas and consequently underlying increment of social interactions, mitigation of local streets has become a new urbanism movement. Therefore, developed states or even many developing countries have attempted to more humanize their urban environments. Thus, these efforts are considered normal nowadays. However, unfortunately urban design and planning in our country tends to vehicles dominance. This is neglected especially in residential areas having the task of providing a safe and secured environment for residents, ensuring their comfort. This study, therefore, aims at contribution to understanding of mitigation techniques and providing practical measures and solutions towards mitigating, adjusting and securing local streets, applied in a case study (Naeem Abad Street in the city of Yazd). The descriptive research method has been used to identify mitigation techniques in the stage of principles formulation by citing to library resources. Analytical research methodology has been used in status measurement phase. Finally, determining the coefficients of each index and their valuation has been done in Expert Choice software in order to evaluate alternatives. The results showed that Naeem Abad Street as a linear center and main crossway of the neighborhood lacks required adjusting and securing measures, bringing about numerous problems to pedestrians traffic. Accordingly, the most important achievement of this research is providing design solutions and practical measures in form of proposed selected option for mitigation, adjusting and securing of Naeem Abad Street.

Key words: Mitigation, Secure, Adjusting, Naeem Abad Street, Yazd

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INTRODUCTION

Increasing number of accidents in city streets and its consequences including high costs, mental health problems and other non-compensable issues have highlighted the need to secure the pathways and protecting the health and safety of users (Mirbaha and Asadamrajy, 2006).

Occurrence of any accident is caused by three main factors including vehicles, humans and the roads. Vehicle speed is considered as one of the most important factors leading to injury or death in an accident. Statistics show that 30-40% of deaths or injuries in accidents are caused by speed factor. In this regard, the most important problem is long time interval between decision-making and stop. Mitigation is one of the main ways to secure the crossways or roads and increasing their safety levels. Nowadays, extensive efforts are carrying out in order to control and reduce the speed of vehicles and the traffic congestion in many countries (Saffarzadeh and Abolhassannezhad, 2005). To create liveable residential streets, designing of main and side streets should be considered from different aspects and the quality of walking routes must be emphasized. These aspects include:

- Separated and safe walking spaces against vehicles passing
- Equipped public spaces
- Attractive appropriate Walking spaces
- The sense of security (suitable lighting systems, dynamic walking environments);
- Low speed of vehicles;

MATERIAL AND METHODS

Todays, most of our urban axes ranging from main streets to the local ones and alleys have turned into geometrical regular axes. Exceptional alleys and streets are also transforming rapidly.

The pattern considering two narrow strips for the sidewalk and one broad strip for the roadway are separated by two Kanivo bands and two rows of narrow strip gardens. It seems that urban planners and managers make no difference between main roadways and sideways. Whether it is a residential 8 meters width street or a passing 30 m one, the only difference considered in this regard is increasing or decreasing the width of sidewalks, roadways and gardens; all should have the roadway, sidewalks and rivulet flanking strips. If we encounter to low spaces, decreasing the sidewalk or turning the rivulet into Kanivo will be done. But our main attempt is dividing the space into seven parallel strips. Each urban area has certain roles and particular spatial expectations. For example, if considering a 30 m street as the typically main one, supplying quick urban transportation, in fact, streets and alleys are the first urban spaces people interact after leaving their private realms. Therefore, the quality of these environments and the type of relationship between the humans and their social relations' context affect the formation of citizens' perception on civil life and neighborly relations. Todays, this happens rarely in our local streets. This is also true about Naeem Abad

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neighborhood. Indeed, this urban neighborhood was an incorporated village to the city. It has a major axis turned into the linear center, connecting the main extra neighborhood axes as a transit crossway. This transmission role has reduced the social role, safety and security within the axis. This leads in a less dynamic and attractive neighborhood. If street cross sections are not fitted to peripheral applications, traffic jams will be made along the crossover. On the other hand, overlaps of pedestrians and vehicles reduce pedestrians' safety. Not using of natural potentials located in margins of the axis such as rivulets and gardens has made a threat to the neighborhood.

Thus, this paper seeks for mitigating, securing and adjusting of Naeem Abad Streets with following objectives:

- Transforming of Naeem Abad Street to a dynamic vital urban space
- Traffic Calming in of this street
- Creating the safe vitality in Naeem Abad Street
- Meeting people's diverse expectations from public space and residential neighborhood functions

Traffic calming

Calming Definitions: Traffic calming is a tool used to make residential neighborhoods more viable. "Traffic calming" is a set of strategies utilized by urban planners and traffic engineers for lowering the speed. This directly results in increased traffic safety, especially for pedestrians and bicyclists. An important side effect of traffic calming-mitigation- is reduced traffic noise and air pollutions (Chavoshi, 2010). Traffic calming in residential neighborhoods means conflicting and excluding the alien vehicles traffic from residential area and reducing the speeds of residents' vehicles in order to improve the safety of the area (Gharib, 2007). Some brief definitions of "traffic calming" are provided from related active organizations here:

(ITE) Institute of Transportation Engineers: Traffic calming consists of appearance changes of the streets or setting various physical barriers to reduce transportation congestion and speed, especially in residential areas, achieving safety of the streets and other public purposes.

(TAC) Transportation Association of Canada: Traffic calming is a set of planned strategies being implemented on a street or a network of streets to modulate motorists' behavior, preventing their inappropriate speed. Traffic management including changes in motion routs and streams of an area is another component of traffic calming.

Transportation organization of Montgomery: Rule enforcement by police, speed displaying signs and speed controlling programs lead in traffic calming together. Speed controlling programs include physical tools such as speed bumps, barriers, squares set for reducing speed (Centre for Scientific and Technical Information on Transport and Traffic).

Objectives and effects of mitigation

Generally, mitigation projects around the world have various purposes. Their main objectives are enhancing safety quality for vulnerable groups, maintaining the performance of presence in public spaces and reducing the number and severity of the accidents in urban crossways.

Other purposes of traffic calming include reducing delinquency rates, increasing the safety of pedestrians and bicyclists, creating appropriate behavior in motorists, reducing vehicles speed, decreasing the interference and collisions among the streets' users and demand reduction (Mirbaha and Asdaamrjay, 2006). Some people find mitigation projects good, some hate them and others think they're sometimes very good and sometimes hateful (Litman, 1999). Many different implementing experience of mitigation have shown its positive and negative impacts. These impacts and purposes are summarized here: (Whitlock and Weinberger transportation, 2003), (Mirbaha and Asadamrajay, 2006).

Traffic calming subjective purposes for residential neighborhoods and specified areas are as follows:

- First purpose: significant: reduction of traffic accidents in the neighborhood.

- The second purpose: creating safe vital public spaces.

-The third purpose: coordinating and responding to people diverse expectations of performance of public space and residential neighborhoods.

Three subsequent working objectives were obtained from above purposes:

- Car traffic reduction
- Decreasing of toxic gases , noise and vibrations caused by moving vehicles
- Decreasing of truck and bus transportation
- Lowering the basic speed for residential streets and traffic jam
- Diminishing the extreme resolution of strip
- Developing movement and play sites
- Expanding of walking spaces
- Impact on motorists' behavior
- Impact on safety
- Increasing pedestrians comfort
- Providing appropriate access to daily required services
- Reduction of negative effects on rescue services and public transportation
- Providing good vision for roadway strip and surrounding environments
- Making attractive streets
- Viable residential neighborhoods
- Reducing the accidents especially in residential areas
- Improved quality of life
- reduced need for police force application
- Greater presence of children in the urban areas

RESULTS AND DISCUSSION

Naeem Abad Position

Naeem Abad Street located in Naeem Abad neighborhood is considered as the linear center. In fact, it is important because of positioning the major neighborhood applications and connecting role between surrounding crossways into the context. From the physical view point, Naeem Abad Street is "L" shaped including perpendicular axis (East-West and North-South Naim Abad).

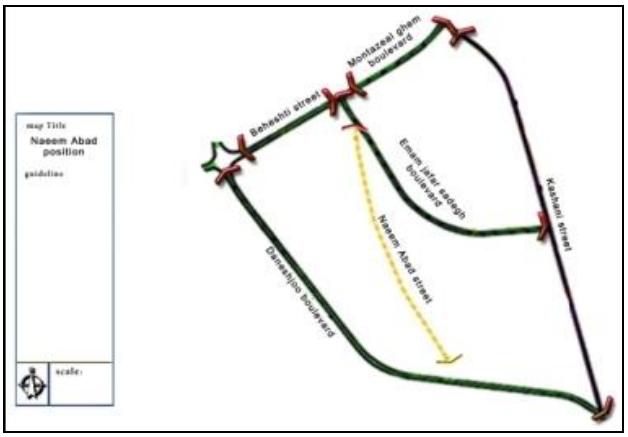

Figure 1. Naeem Abad position

Road Axes to Naeem Abad Axis

There are three main axes in Naeem Abad in which north -south axis bears more traffic loads. In addition, this social crossway is considered as the linear neighborhood center due to its position, playing an access role. In order to mitigation, therefore, north- south axis may be replaced by two other parallel and perpendicular axes (East- west axis) indeed, this reduces risky potential of Naeem Abad node (Naeem Abad crossroad) and enhances the social role and safety of the roadway.

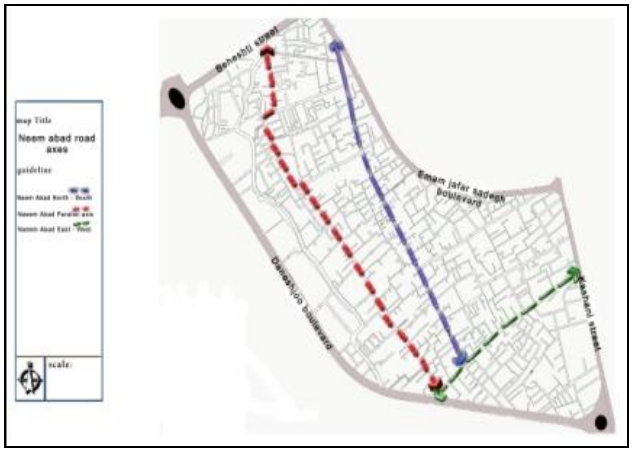

Figure 2. main road axes to Naeem Abad axis

Axes Branched From Naeem Abad Axis

The map below shows the axes branched from the main axis of Naeem Abad neighborhood. Based on physical perceptions, these roadways conduct much of the passing traffic through Imam Jafar Sadiq and beheshti Boulevards into the context and specifically Naeem Abad Street. Meanwhile, based on previous studies, some of these axes can be blocked and their passing traffic jams may be transferred to similar road axes with the same functions.

Nodes

Node identified in the neighborhood include functional, social and traffic nodes.

External traffic nodes mostly located at the junction of the entering main roadways of the neighborhood. In contrast, internal traffic nodes located in the crisscross of North -South and West-East axes.

Social nodes consist of People's rendezvous suggested to be reinforced in order to calming. Functional nodes are accumulative site for inter neighborhood applications, performances and activities. They can be improved by organizing and making an appropriate connection to the main axis.

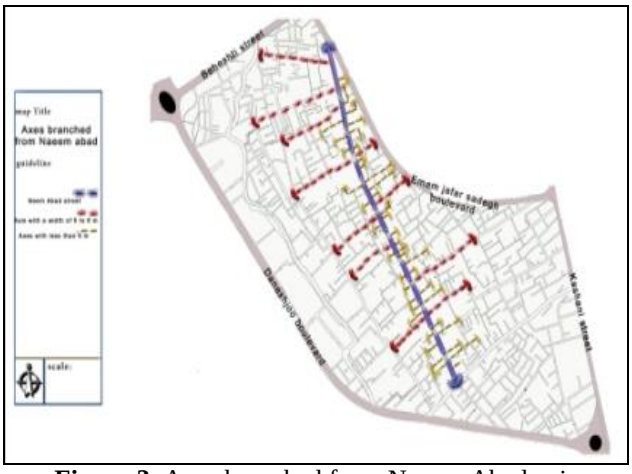

Figure 3. Axes branched from Naeem Abad axis

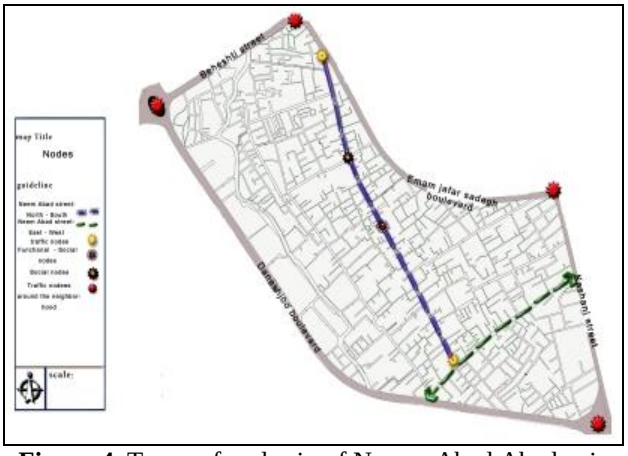

Figure 4. Types of nodes in of Naeem Abad Abad axis

Sections of Naeem Abad north-south axis

There are three sections of 8, 10 and 12 meters in Naeem Abad axis. These sections are not generally compatible with surrounding uses. The lack of separation between sidewalks and roadways, and sidewalks and rivulets has reduced safety. The 8 meters section at the end of Naeem Abad pass away has a 1.5 meters sidewalk as the smallest pavement on local streets. Absence of shielding between the sidewalks and rivulets has decreased safety. Due low width of the crossway, marginal parking will leads in its obstruction. Also, due to the lack of garage, residents use pavement margins to park their cars, impairing pedestrians' traffic.

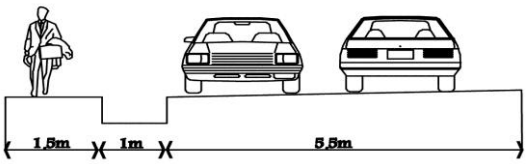

Figure 5. 8 m section of Naeem Abad axis

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There are two 1 and 2,5 m sidewalks in 10 m section with nonstandard width of 1 m one and no separation to roadway part, leading in safety reduction. Due to low width of the crossway, marginal parking will leads in its obstruction. Also, due to the lack of garages, residents use pavement margins to park their cars, impairing pedestrians' traffic.

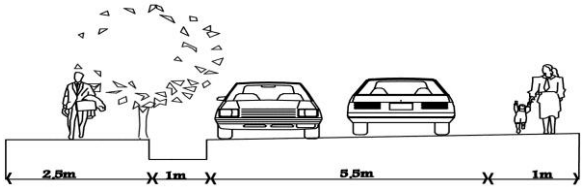

Figure 6. 10 m section of Naeem Abad axis

There are two 1 and 2,5 m sidewalks in 12 m section with nonstandard width of 1 m one and no separation to roadway part, causing reduced safety in this axis. Due to population-attracting applications around it such as mosque and absence of garages, ceremonies make heavy traffic and congestion.

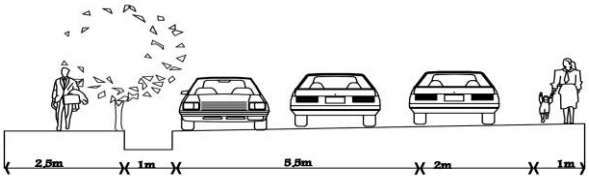

Figure 7. 12 m section of Naeem Abad axis

Crossway adjacent uses

As shown in map below, there are residential, educational, commercial, religious, farming and garden uses around the north-south Naeem Abad crossway. Unfortunately, the cross section of the street is inconsistent with surrounding uses. For instance, there is no parking for educational, commercial, religious sites. Existence of neighborhood center in this street attracts population from all over the neighborhood. Absence of public garages and low width of the street have caused traffic jams and other problems for residents. Due to lack of parking, some residents use pavement to park their vehicles, impairing foot traffic.

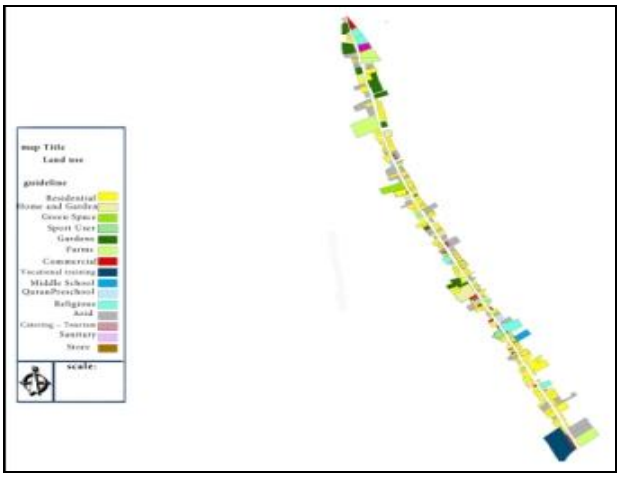

Figure 8. Land uses of Naeem Abad axis

The amount of traffic loads on naeem abad street

Based on performed studies, traffic deductions, traffic load measurement of Imam Jafar Sadiq and Shahid Beheshti Boulevards and their connecting axes to Naeem Abad axis, it was found that a third of traffic loads enters the main Naeem Abad axis. More than half of this traffic load is passing traffic and local traffic accounts for the rest. Therefore, it can be concluded that the road axes with similar functions may be suitable alternatives for mitigating the main passageway of Naeem Abad.

Table 1. Summary of intervention area identification

Facilities	Restrictions
Social role of Naeem Abad crossway	• Absence of hierarchy in local crossways
Neighborhood center in Naeem Abad axis	• Absence of separating barrier between the roadway and sidewalks in Naeem Abad and other local crossways
Marginal rivulets and beautiful natural landscapes	• Public transport vehicles don't enter the crossway of Naeem Abad
Social and functional Nodes in Naeem Abad axis	• High Speed of vehicles passing through the crossway of Naeem Abad
Potential social interaction spaces in the main passageway of Naeem Abad	• Low width of more than 40 percent of local roadways, emergency vehicles can't enter.
Residents' tendency to passageway Widening	• Traffic nodes and risky spots
Wasteland in margins of Naeem Abad	• Absence of public garages around the crossway of Naeem Abad
Appropriate slope of Naeem Abad	• Incompatible cross sections of Naeem Abad to around land usese
Possible organizing of surface waters	• Lack of clear plans and the project lines for Naeem Abad main axis
The Parallel axis to the main passageway of Naeem Abad , an alternative for its transit traffic	• Inappropriate wall of the crossway • No urban furniture in crossway margins • Traffic jams in the main crossway (special ceremonies) • Adjacent traffic nodes • Inability to dispose of surface waters and flooded local streets • Construction of Imam Jafar Sadiq Boulevard and the rupture in the context of the neighborhood and traffic attracting into neighborhood • many Inactive land uses around the main passageway of Naeem Abad • Inappropriate beds in some parts of the main crossway • Night poor lighting • 10 mosques in margins of main crossway cause troubles for its widening (restriction to the religious uses' ownership)

Providing design strategies and solutions

Given the purposes, possibilities and restrictions of the area, design and intervention, and based on performed studies in understanding step, design strategies and solutions are provided in three sections including secure, mitigating and adjusting in order to solve the problems.

Providing options and selecting the appropriate model for mitigation (best alternative)

Following options are addressed in order to mitigating, securing and adjusting of Naeem Abad axis based on performed studies, aiming at enhancement of the crossway social role. Then, proposed options will be examined and finally, evaluated based on predetermined objectives.

Table 2. Mitigation Strategies and solutions

Strategies	Solutions
Decreasing the speeds of motor vehicles	• Embedded speed bumps in cross strip of the crossway, especially in places with higher traffic of vulnerable people and children (schools and parks) • Narrow streets and roadways of vehicles via embedding vertical elements such as trees or tables, visually reducing the width of the streets and thus, the motorist lowers his/her speed. • Considering alternative and shortcut routes associated with Naeem Abad street
Enhancement of the relationship between the land use system and transportation ones	• Proper relationship between proposed and existing uses and public transportation routes • Creating mixed applications to reduce travel distances between residential , business and shopping sites • Public garages
Traffic smoothing	• Eliminating marginal Park • Public garages in sites with population-attracting applications • Segregated sidewalks, roadways and bike riding routes

Table 3. Securing Strategies and Solutions

Strategies	Solutions
Increasing safety of pedestrians' traffic	• Separating of foot and road patterns by creating physical barriers such as sharp cornered tables • Ease of pedestrian traffic by definition of Street , , bottlenecks and safety islands
Mounting warning signs to increase safety of road traffic	• Painted words or signs on the crossway level • Changing the context of the crossway • Rumble Strips and Textured Crossing • Horizontal signs (Pavement Marking) such as colored lines on streets superstructure surfaces • vertical signs such as warning signposts and speed limit • Cobblestone superstructures at some sections
Risk reduction in disaster-prone areas	• Randaboat design and large circular islands projected in the middle of main intersections, especially Naeem Abad crossroad • Stop and speed limit signs at the entrance of the side streets connected to Naeem Abad • Vertical speed control equipment (speed bumps, virtual speed lower and pedestrian crossways) • Speed reduction via projected marginal tables flanking the crossway and narrowing the passage entrances leading to the intersections • Obstruction of Side streets connected to Naeem Abad centric occlusion by physical barriers
Reducing the amount of passing traffic entering through around main streets into the main axis of Naeem Abad	• Complete obstruction of Side crossing entrances or barrier, semi barrier, turning and diameter deflective

Table 4. Adjusting Strategies and Solution

Strategies	solutions
Creating appropriate public transport contexts	• Increased number of public buses • Creating a new track in Naeem Abad axis • Improving the sunshades, appropriate access routes at the stations • Ticket booths and the development of electronic payment systems • Appropriate maps and signs in the stations • Increasing the number of urban taxies fleets, particularly in Naeem Abad axis
Giving priority to foot movement pattern	• Increasing the bandwidth of sidewalks (sidewalks widening)
Increasing the attractiveness in spatial structure of sidewalks	• Appropriate Infrastructures and design of environments around Naeem Abad axis • Perfect lighting of streets, trees and waterfronts • Attractive events at the end of walking tracks • Linking various public spaces and walking tracks • Appropriate furniture in walking tracks • Increased cleaning and management of sidewalks • longitudinal Green spaces in direction of the main crossways • Creating green spaces to reduce the rate of car transportation
Improvement of the walls status	• Using of diverse harmonic construction materials and styles to ornament walls • Removing the confusing elements such as electrical wires and cables, messy panels and... • using of colors and plants in order to reduce the uniformity of crossways walls • Enclosure of inactive gardens and agricultural lands • Creating gardens and trees around the axis or near the residential areas • Reconstruction of destructed houses • Repairing the water storages • Restoration of old valuable houses • Harmonizing of views by using of coordinated native materials
Making a comprehensive interconnected network of walking tracks, sidewalks and transverse pedestrian crossings	• connecting the axes by functional diversity • Construction of bike riding bands separately or as special lines on streets and crossways with appropriate width • Creation of bicycle parking spaces in the neighborhood connections with other transportation modes, especially bus stops with enough shade • Garages in crowded places
Considering measures for adjusting of public spaces	• Group furniture embedding based on local culture and application in people pauseing areas • Making preferably simple furniture designs suited to the local culture, basic concept • Locating ashcans along the way, especially near the public and pausing spaces
Adjusting environments for certain groups, particularly women, children, elderly and disabled people	• Proper furniture placement in public and pausing spaces • Using appropriate non-sliding flooring • Preventing of differences between the level and stairs in public places and sidewalks • Preventing defenseless spaces and providing proper lighting in order to increase security, especially for women • visible walking space to inside from the bodies • Prevention of making hidden and dark corners • Creating attractive diverse applications for various social, age, gender groups of citizens.
Enhancing the vitality of the street	• Creating day-night uses • Creating mixed uses especially in neighborhood center • Increased Security • using of sidewalk spaces for restaurants • Garden-restaurants in marginal places • Benches, waterfronts, coffee shops along the street • Service and leisure applications • Plant cultivation on the sidewalks

Option 1: converting of Naeem Abad axis to the walking track

In order to promote the social role of this axis, crossway is widened up to 16 m. The parallel crossway be widened to 12 m is considered as an alternative and north-south axis will become walking track.

A 2,5 m width axis flanking the walking crossway is considered for residents' access to their houses and comfort of elderly and disabled people at night. The proposed axis can be used as an overnight load discharge way for business and service units, increasing the space flexibility. A 2,5 m width special route is proposed in Naeem Abad axis to increasing its vitality. Utilization of natural resources such as water resources and gardens and incorporating them to the proposed walking track and potentials has been considered in design. Constructing linear parks along the track, regarding interactive spaces for citizens equipped with urban furniture and waterfronts, as well as organizing marginal rivulets are measures being addressed in this option.

Due to their inconsistency with the residential neighborhood, applications such as warehouses and workshops are removed from the main street borders. Barren lands are recommended for commercial, service and cultural uses, promoting the vitality environment.

The benefits of this option would be as follows:

- Enhanced social role of the street
- Increased vitality and attractiveness of the street
- Eliminating the transit traffic
- Utilization of Natural Resources

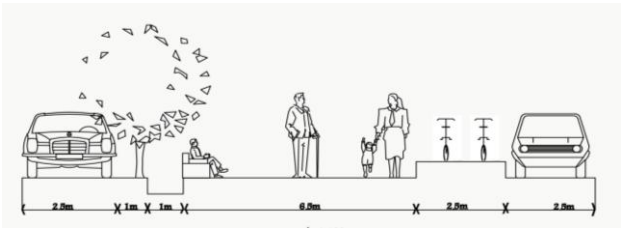

Figure 9. Converting of Naeem Abad axis to the walking track

Option 2: emphasis on the priority of pedestrian movement pattern

In order to achieve the project objectives, promote the social role of this axis and traffic calming, increasing its width and turning it into the track with pedestrian traffic priority are recommended. In this regard, crossway is widened from its current level (8-12 m) to 16 m and consequently the bandwidth of the pavement is also expanded.

In addition, the special 2.5 m width bike riding track has been proposed to facilitate bike traffic and its separation from the roadway and sidewalks routes.

The benefits of this option would be as follows:

- Enhanced social role of the street
- Increased vitality and attractiveness of the street
- Reducing the transit traffic
- Utilization of Natural Resources
- Considering the principle of social and gender justice
- Increased street dynamics
- Lack of merely segregation of transportation patterns
- Residents' convenient access to residential units
- Attending to the Public Transport System
- Fairly division of traffic loads in axes

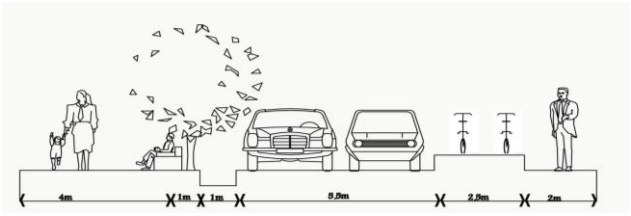

Figure 10. Emphasis on the priority of pedestrian movement patterns

Option 3: traffic facilitation in Naeem Abad crossway with minimal intervention

In this option, lane widening up to 14 meters is recommended in order to facilitate traffic. Foot and road traffics are separated to enhance the safety (by making two 2.5 m width sidewalks). Speed bumps are set near green spaces and schools provide comfort of vulnerable groups including women, elderly people and children.

Border park is also eliminated to improve the road traffic park and near public garages must be constructed near the crowded sites. On the other hand, using the potential of the neighborhood will organize water rivulets and urban furniture placement will enhance the vitality of the street. To enhance the security and tailoring the crossways, wasteland and agricultural lands should be enclosed and street lighting be modified.

The benefits of this option would be as follows:

- Utilization of Natural Resources
- Low cost of implementation
- Passing traffic smoothing
- Facilitating of access to surrounding land uses

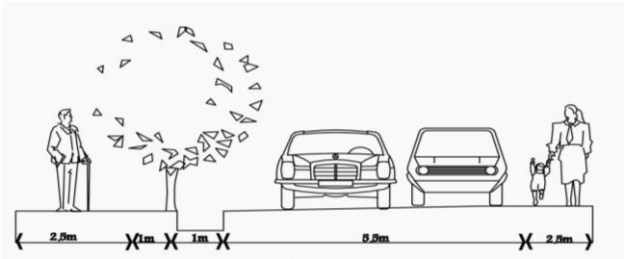

Figure 11. Traffic facilitation in Naeem Abad crossway with minimal intervention

Evaluating and selection of the best option

In order to evaluate the options presented above, 10 criteria including efficiency, pedestrian-orienting, safety and security, feasibility level of the plan, justice, accessibility, attractiveness and vitality, aesthetics, environmental consistency, and, coordinating and responding to the residents' needs were addressed .Then, each criterion was valued using Delphi technique and Expert Choice software. Among all, safety and efficiency have highest values and efficiency has the lowest one. Next, each option was scored according to these principles. The final score of each option was calculated by sum of multiplying the standard value by the option score.

Table 5. Adjusting Strategies and Solution

Criteria	Indices
Efficiency	• adaptability and flexibility of land uses • Compliance with rules and regulations • Feasibility level of the plan
Pedestrian-orienting	• Safe , diverse and attractive sidewalks • Pause and social interactive spaces along sidewalks • Urban furniture embedded in pause spaces and sidewalks • Preventing of the Foot and road traffic interference
Safety and security	• Safety of the crossway • The rate of people presence in public arenas • Reduce risk-prone spots and traffic nodes • Reduced interference between Foot and road traffic
Feasibility level of the plan	• Compliance with the upstream Plan • Duration of the project • The costs of the project • Compliance with regulations
Justice	• Justice in uses distribution • Justice in access to land uses • Gender equality (considering specific areas and measures for women, children and the elderly people)
Accessibility	• Appropriate walking access to daily uses and public services • Road and foot access to the residential units • Access of Emergency vehicles to all residential, commercial and service units
Attractiveness and vitality	• Enforcement of the neighborhood center • Usage Diversity • Multiple of public arenas • The rate of people presence in the public arenas • 24 hour uses • mixed uses
Aesthetics	• Attending the aesthetics view of the area • Reduced visual pollutions
Environmental consistency	• Preserving the agricultural lands • Reduced environmental and audio pollutions
Coordinating and responding to the residents' needs	• Considering residents' wishes and needs in selection and positioning of uses

Table 6. Assessment of Option 1: Converting of Naeem Abad axis to the walkway

Number	Criteria	Value	Score	Total
1	Efficiency	0.074	3	0.0222
2	Pedestrian-orienting	0.081	9	0.729
3	Safety and Security	0.135	7	0.945
4	Feasibility level of the plan	0.091	3	0.273
5	justice	0.119	5	0.595
6	Accessibility	0.081	3	0.243
7	Attractiveness and vitality	0.123	7	0.861
8	Aesthetics	0.079	5	0.395
9	Environmental consistency	0.115	7	0.805
10	Coordinating and responding to residents' needs	0.102	3	0.306
-	**Total**	**1.000**	-	**5.738**

Table 7. Assessment of Option 2: Emphasis on the priority of pedestrian movement pattern

Number	Criteria	Value	Score	Total
1	Efficiency	0.074	7	0.518
2	Pedestrian-orienting	0.081	5	0.405
3	Safety and Security	0.135	7	0.945
4	Feasibility level of the plan	0.091	5	0.455
5	justice	0.119	7	0.833
6	Accessibility	0.081	7	0.567
7	Attractiveness and vitality	0.123	7	0.861
8	Aesthetics	0.079	7	0.553
9	Environmental consistency	0.115	5	0.575
10	Coordinating and responding to residents' needs	0.102	7	0.714
-	**Total**	**1.000**	-	**6.426**

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Table 8. Assessment of Option 3: Traffic facilitation in Naeem Abad with minimal intervention

Number	Criteria	Value	Score	Total
1	Efficiency	0.074	5	0.37
2	Pedestrian-orienting	0.081	3	0.243
3	Safety and Security	0.135	5	0.675
4	Feasibility level of the plan	0.091	7	0.637
5	justice	0.119	3	0.357
6	Accessibility	0.081	7	0.567
7	Attractiveness and vitality	0.123	5	0.615
8	Aesthetics	0.079	3	0.237
9	Environmental consistency	0.115	3	0.345
10	Coordinating and responding to residents' needs	0.102	5	0.51
-	**Total**	**1.000**	**-**	**4.556**

As shown in tables above, the option 2 (Emphasis on the priority of pedestrian movement pattern) obtained the highest score and selected as the best option.

In order to fulfill ahead option, proposed measures are described in three parts:

Measures towards mitigation

- Substitution of Naeem Abad axis by parallel road axis to transfer the passing traffic through its widening up to a width of 12 m.
- Limiting of the side streets branched from Naeem Abad axis between it and main surrounding crossways of the neighborhoods including Shahid Beheshti and Imam Jafar Sadiq Boulevards through blocking of these routes (half- barriers).
- Reducing of roadway bandwidth to slow down motor vehicles by projections and physical barriers
- Embedding speed bumps along the way, especially near the schools and green spaces for providing the comfort of vulnerable groups with emphasis on audio and visual warning signs.
- Mounting the speed limit signs along the route at appropriate intervals
- Eliminating od marginal park and making public garages in borders of the crossway, especially near of the public crowded sites

Measures towards securing

- Separating the walkways and roadays
- Facilitation of pedestrians' traffic cross the street through middle island definition
- Geometrical correction of intersections, especially in risk-prone spots
- Considering measures to increase driver visibility (chamfer)

Measures towards adjusting

- considering measures to tailor public spaces in accordance with the characteristics and needs of all age and sex groups, especially vulnerable groups such as women, children and the elderly people
- Creating a comprehensive interconnected network of sidewalks and transverse walkways , emphasizing attractive appearance of sidewalks
- Enhancement of Vision and landscape in Naeem Abad crossway emphasizing the native materials utilization
- Making suitable contexts for public transport system and its traffic
- Organizing of water rivulets and urban furniture along the way to enhance the vitality
- Converting marginal gardens into garden-restaurants in order to increase the attractiveness and vitality of the street

CONCLUSION

As stated previously, residential areas must guarantee a safe and comfortable environment for residents, providing an interactive context for citizens. In contrast, there are high rates of accidents and their consequences in residential areas. Therefore, it can be said that the most important reason for this dilemma is the absence of any urbanism and traffic measures for securing and mitigation. Pedestrians is the first priority in local roads but due to absence of the necessary measures for mitigation and creating safe conditions, vehicles speed does not comply with the crossway width, causing accidents with irreversible consequences. In recent years, mitigation projects as the plans related to transportation planning and urban planning and designing, have received increasing attentions so that it has turned into a modern urbanism movement.

Therefore, the main purpose of this study is helping to identify mitigation techniques and providing practical solutions and measures towards mitigation, secure and adjusting of local streets. This has been applied in a case study (Naeem Abad Street in Naeem Abad neighborhood in the city of Yazd). This axis is considered as the center of this linear neighborhood. This street is important because of positioning the major uses of the neighborhood in this axis and its connecting role. In order to achieve the study purposes, restrictions and possibilities of Naeem abas crossway were measured from the urbanism and traffic viewpoint. Then, strategies and practical measures to improve facilities and reduce restrictions werw presented in three distinct areas (mitigation, securing and adjusting). In the next stage based on the status assessment findings, three alternatives were proposed for implementation of strategies:

Alternative I: Converting of Naeem Abad axis to the walking track

Alternative II: emphasis on priority of pedestrian movement pattern

Alternative III: Traffic Facilitating in Naeem Abad crossway with minimal intervention.

Finally, in order to select the best proposed design, criteria were valued by Expert Choice software. Based on this assessment results (achieving the highest scores), and according to local circumstances, alternative II (s emphasis on priority of pedestrian movement pattern) was selected as the final option. In order to fulfill the recommendations of the selected option, eventually, practical measures were divided into three areas including

mitigation, securing and adjusting for Naeem Abad Street as a local crossway.

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