



Monitoring the Process of Destruction of Informal Settlement Neighborhoods Using Multi-Temporal Satellite Images

Mohsen Ahadnejad Ravshy¹, Somayeh Alipour², Abraham Sharifzadeh Aghdam³

¹ Geography and Urban Planning, University of Zanjan, Iran

² Geography and Urban Planning, University of Zanjan, Iran

³ Geography and Urban Planning, University of Zanjan, Iran

Corresponding author: ebrahim.sharifzadeh@gmail.com

Abstract:

The aim of the present study was to monitor the process of destruction and clearance policy of the informal settlement in Islamabad neighborhood, Karaj in the years following the initiation destruction and clearance of the over-1400 meter altitude project and to evaluate its success rate based on the experts' views. The study was an applied research and in regard with its nature was descriptive-analytical. Multi-temporal high resolution satellite images that had been retrieved over 2002-2014 were utilized to evaluate and monitor the destruction process in the neighborhood. The results of the study indicated that destruction and clearance began in 1995 and have lasted till 2014. Moreover, the results proved the failure of the project from the initial administrative stages and over the last two decades according to the experts and the informal settlement authorities' views. Finally, utilizing ANP model indicated that the most important factor in destructing the neighborhood was the policy of destruction and the second factor was the bad scenery that the neighborhood had given the city entrance.

Keywords: Informal Settlement; Satellite Images; Destruction and Clearance; Islamabad

1.0 Introduction

primary settlement, which has rural form, has been changing little by little after foundation of cities and developing them and cities gradually became large and revealed differences between biologic blocks during many years (lotfi, 2011). Nowadays informal settlement has become an outstanding sign and main criterion of urbanization so that now 1.6 of the world population is living in such informal habitats (Sarafi, 2003). According to the estimations conducted by the UN, in developing countries 1 out of 5 urban residents lives in an informal habitat (Habitat, 2002), (Unhabitat, 2003). Here, it is necessary to take these places into consideration and organize them in order to prevent the problems and crises from intensifying. An approach to deal with this type of settlement is destruction and clearance approach that was common in the past and is no longer utilized. However, it is still applied in the third world countries. Karaj as an urban place is located in the vicinity of Tehran and on the highway

that links the capital to the west and northwest of the country. Due to locating near and on the functional node of Great Tehran, on the one hand, and holding important factories with fundamental activities, on the other hand, Karaj has been paid close attention by those who have tried to immigrate to Tehran. Informal centers of Karaj in some neighborhoods are naturally being renovated and merging in the formal urban development process. But in some sections, spontaneous development and informal settlements are growing. Zourabad Hill is nationally and universally famous for being the first informal settlement. During the early years following the Islamic revolution, informal settlement in Karaj developed rapidly and other informal centers emerged. During their development process, these centers utilized various mechanisms and could attain some superstructure services (schools, clinics, etc.) and infrastructure (water, electricity, gas, and telephone). They also enhanced

their physical shape such that they could relatively organize their urban public spaces, facilities, and even strength of residential structures. Shortly, they have proved their position in the city and become an inevitable part of Karaj, which is the nature of most cities in the third world countries (Pardaraz Counseling Engineers, 2008). The project of organizing Moradab Hill was proposed in 1991. In 1992, various field studies were conducted on physical space and socioeconomic issues under the supervision of the Islamic Revolution Housing Foundation. In 1993, the project of destructing a part of Moradab Hill, displacing a part of the residents, and improving other sections was executed. The proposed structures to be destructed in the abovementioned project included upper sections of the hill that had an unsuitable appearance and faced with major difficulties in providing services, organizations, and urban facilities. In fact this approach has targeted stage destruction of the structures. The project of destruction and clearance began in 1995 with purchasing, possessing, and destructing the proposed area of 72 acres by the office of organizing Moradab Hill and has lasted until now (2014). (Bavand Counseling Engineers, 2004).

2.0 Materials and Methods

Hypothesis: Considering the lapse of 20 years from the beginning of the project of destruction and clearance in Islamabad neighborhood, now some questions are to be posed like whether the project has completely been conducted or not, in what stage it is, and to what extent it has been successful. These questions resulted in the following hypotheses:

- The project of destructing and clearing the informal settlement in Islamabad neighborhood has completely carried out.
- The policy of destruction and clearance in the target neighborhood (Islamabad) has been successful.

3.0 Theoretical Concepts:

3.1 Informal Settlement:

It is a particular type of habitat that is fundamentally different from the whole city and adjacent areas in all aspects and in regard with its historical changes. Characteristics of such habitats include unusual housing, narrow streets and allies, environmental and health problems, high density of population, cultural poverty and social disorder, vulnerability to natural disasters, low urban facilities and services,

informal occupation of the residents, illegal occupation of the land and lack of legal ownership of it, and so on (Piran, 2002; Ghasemiandall, 2003; Dawudpour, 2005; Alipoor, 2015).

In many countries a large percentage of people in large cities live in informal settlements. According to a 2005 UN report, 30 percent of people in the big cities live in informal settlement (UN_habita, 2005). In spite of common and similar basis in different countries, the process of forming and evolution illegal settlement was different regarding to geographical, social and economic differences and The presentation of comprehensive pattern was impossible, but common element was found among process that the process of forming and creation of above settlement had one foundation and economic logic among poor through point viewpoint of Gilbert and Galger, the reaction of poor against of poverty about house was new and wisely logic (Gilbert and Galger 1996; Board of Ministers, 2004; Gharagl et al., 2009). For example; the amount of slum dweller and illegal settlement was 9% in Lima and 65% in Ozmir in development countries (Khakpour, 2010). For most economical and logical way of owning house was frequently construction of illegal settlement and habitation in illegal areas. People who were low paid and couldn't access legal and common habitant, could buy house in three ways: 1) To find old shelter in old areas of city center with illegal settlements 2) To possess lands with proper conditions of residence 3) To settle half legal and buy land without substructure through illegal way Three cases shows development of preprogramming that follows a certain rotation. The rotation passes a habitation, construction, program and illegal development and it finally follows programming, legal regularity and stabilization (Garau.2005; hadizade, 2003).

3.2 Informal Settlement in Iran:

Informal settlement in its current form began in the 1940s and rapidly developed until late 1950s. After Islamic revolution, it was recognized as one of the fundamental urban problems. During this period, due to the distance between villages and cities, some villagers have immigrated to cities in seeking employment, which has been associated with various problems. In the meantime, issues like land reforms and oil price increase have resulted in formation of informal settlements at the margins of and even within the cities (Zomorodiyani et al, 2002). In the early years after the Islamic revolution in Iran,

due to political riots and urban development policies like providing housing for the lower classes of the society which was originated from the revolution values especially the policies of urban lands that had belonged to the previous regime's influential individuals who had left the country and their ownership was abolished, these lands were occupied by particular groups of people and informal settlements formed around and even within the cities (Beigdeli, 2004). (Alipoor, 2013). One of the main causes of informal settlement formation in Iran is immigration (Mahdavi, 2001), (Shokuei, 2001) whose extensiveness in today's world can mostly be evaluated at macro scale (Saberi, 2011). Moreover, causes like reduction of housing cost (Payan, 2004) and low cost of land and housing in some areas have resulted in immigration and creation of such neighborhoods (Farhoudi, 2004; Zahedani, 1991; Habibi, 2002).

4.0 Scope of Project:

The Scope of the Study:

This neighborhood is located within the old core of Karaj and Azimiyah neighborhood, i.e. the northeast of the city. Investigating the map of Karaj's growth and development indicates that there had not been much evidence of this neighborhood until 1974. There are a hill and a steep slope which are considered as the most important developmental barriers. Development of the lower parts of the hill during (1970-1974) highlights this fact that the development process began from the lower part of the hill which is less steep and more appropriate for construction. And once the lower parts had been occupied gradually, occupation of the upper parts began (Bavand Counseling Engineers, 2004; Pardaraz Counseling Engineers, 2008)

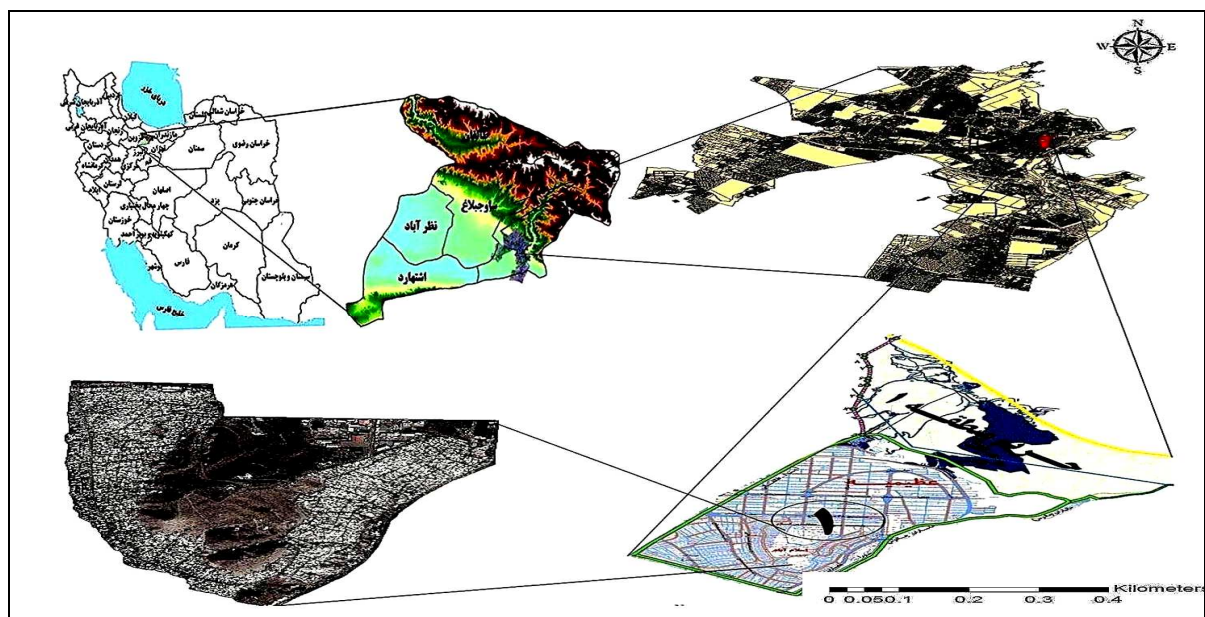


Figure 1: The location of Islamabad and the area of destruction and clearance

5.0 Results and Discussion:

These results have been attained through periodic satellite images and the existing data and statistics on the number of the destroyed units, the destroyed and cleared area, and the displaced residents according to the informal settlement and slum experts' views on the success rate of the project.

5.1 Investigating and Evaluating the Level of Destructions in Islamabad Using Periodic Satellite Images of 2001-2014

High resolution satellite images have been utilized in order to investigate the state of destructions in the neighborhood. The images were taken during 2000-2014 and the destruction process in different neighborhoods has been showed.

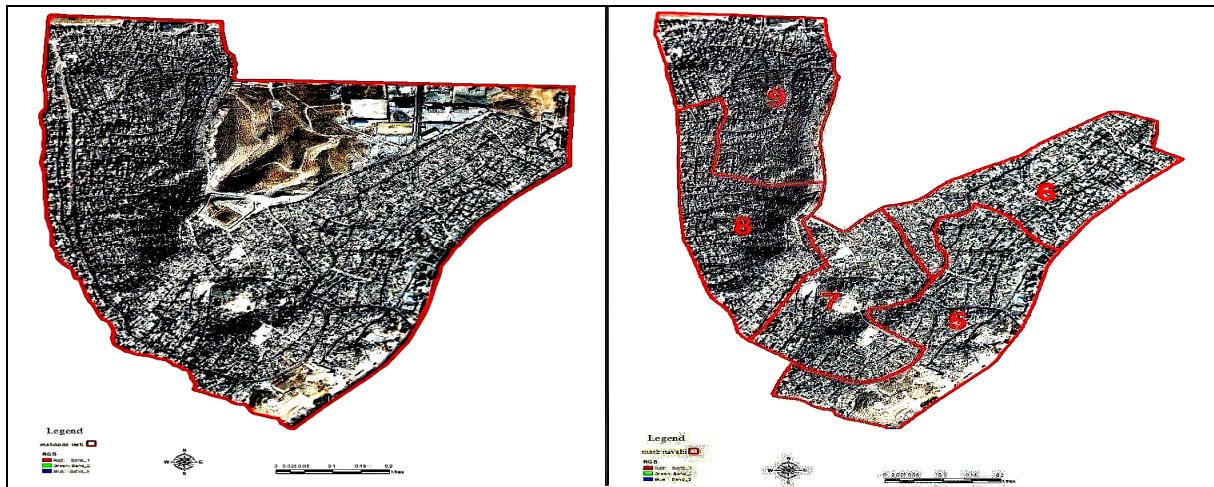


Figure 2. The satellite image of the destruction and clearance area in Islamabad in 2001 (Source: www.usgs.com)

These satellite images are related to the destruction and clearance area of Islamabad in early 2002. It covers an area of 72 acres. The images show the

destruction rate in the municipal neighborhood divisions.

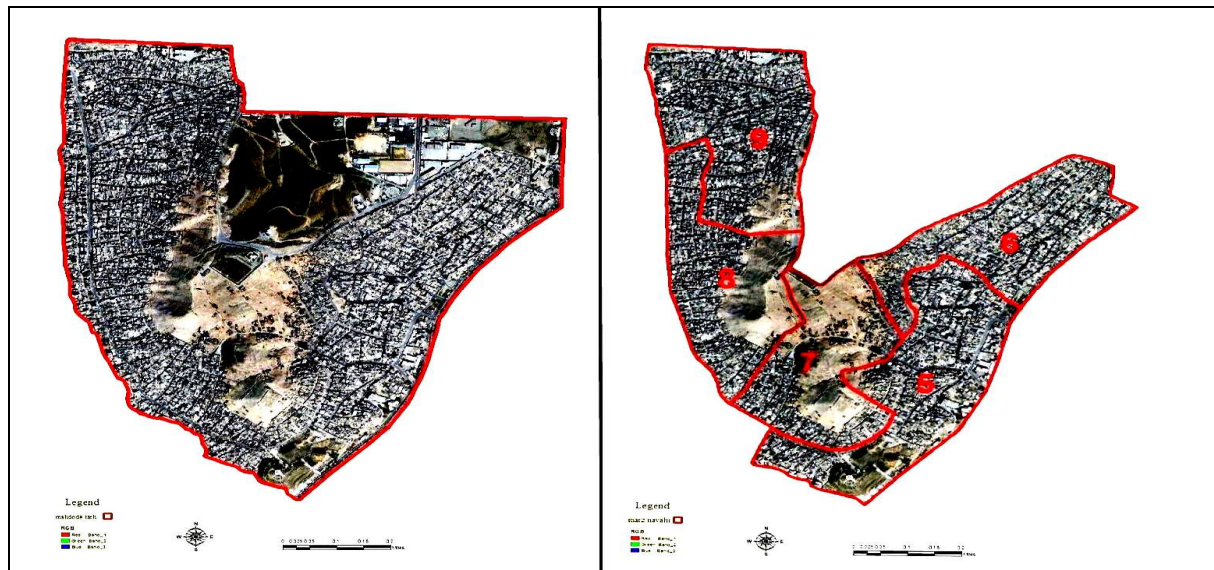


Figure 3: The satellite image of the destruction and clearance area in Islamabad in 2005 (Source: www.usgs.com)

The above image is related to the destruction and clearance of Islamabad neighborhoods in 2005. As the statistics indicates the seventh neighborhood has gradually been cleared of the habitats. The satellite image taken in 2008 indicates the

destruction and clearance of Islamabad at an altitude of lower than 1400 meters such that the destruction in the eighth and ninth neighborhoods is remarkable.



Figure 4. The satellite image of the destruction and clearance area in Islamabad in 2009

Source: www.usgs.com

Figure 4 is related to the destruction and clearance of Islamabad in 2009, in which the destroyed units

up to 2009 are showed, which has taken a downward trend.

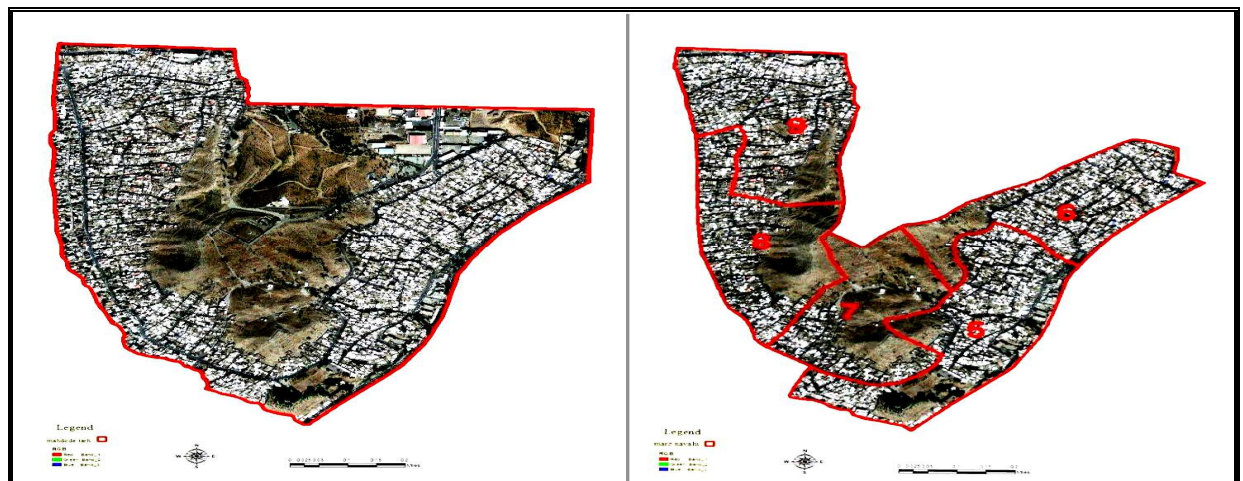


Figure 5: The satellite image of the destruction and clearance area in Islamabad in 2011 (Source: www.usgs.com)

The above image is related to the destroyed area of Islamabad in 2011, in which the destroyed units are showed.



Figure 6. The satellite image of the destruction and clearance area in Islamabad in 2013 (Source: www.usgs.com)

Figure 6 that shows the neighborhood destructions up to now is related to the destruction and clearance of Islamabad in 2014. According to this image, by 2013 the seventh neighborhood has had the highest rate of destruction followed by the eighth neighborhood.

5.2 The state of changes and developments in the destructed units in Islamabad neighborhoods during 2002-2012

In this section, the number of the destructed units in the second decade of ownership and destruction proceedings in different neighborhoods during 2002-2012 is presented. Table 1 indicates the detailed statistics of these proceedings.

Table 1: The total proceedings in the second decade of destruction and clearance project in different neighborhoods (2002-2012)

Municipal division of the neighborhoods	Traditional division of the neighborhoods	Number of the destructed units	Percentage of neighborhoods ownership	The area of the field	The area of the buildings	Total area	Mean of the field	Mean of the buildings	Population	Percentage of the population
5	1.2	208	6.53	16774.13	18565.82	32951.58	86.59	100.78	985	6.54
6	1.2	524	16.46	37386.68	41496.74	78491.52	72.04	107.07	2469	16.39
7	2.3	1190	37.39	92994.86	100481.3	192297.2	88.1	103.79	5573	37.01
8	3.4	731	22.97	49398.44	51800.6	110921.4	79.61	99.87	3527	23.42
9	5.6	528	16.59	36961.52	38673.57	75442.81	70.95	81.18	2502	16.61
Collect		3182	100	233515.63	251018.00	490104.46	-	-	15056	100
Mean		636.2	-	46703.12	50203.60	98020.89	79.45	92.20	-	-

Source: Statistics retrieved from the office of organizing Islamabad, 2013

Table 1 includes the data of the destruction of the habitats in different neighborhoods in the second decade of destruction and clearance between 2002 and 2012. Municipal division includes 5th, 6th, 7th, 8th, and 9th neighborhoods, which is different from the traditional division. According to the existing statistics, out of 3182 units, the 7th neighborhood with 1190 destructed units has won the first place. Proportional to the number of the units, it has the largest areas of field and buildings. In regard with the average destruction, the 7th and 8th neighborhoods with respectively 88 and 107 m² have had the highest averages and the highest number of population of 5573 people (37%) is related to the 7th neighborhood.

5.3 Investigating the Changes in the Displaced Population from Islamabad to Other Places during 1995-2012:

Due to ownership and destruction of the habitats by the office of organizing Islamabad, the residents of the units and neighborhood had to quit. The size of the displaced population has been different in different years according to the number of the destructed building units. During these years, a total of 20722 people have been displaced and resided in

formal and informal settlements in other neighborhoods of Karaj after their habitats had been purchased and destructed by the office of organizing Islamabad neighborhood. The year 2003 with a total displaced population of 5607 people has won the first place (Statistics data of the office of organizing Islamabad, 2013).

5.4 The Experts' Theories on Evaluating the Destruction and Clearance of Informal Settlement In Islamabad

The results of this section have been attained through interviewing informal settlement and suburb experts. In continuation, their theories of different issues will be discussed and evaluated.

5.4.1 The Reasons for Adopting the Policy of Destruction and Clearance of Islamabad:

The reasons provided by the experts include instability of the neighborhood and high steep at an altitude of over 1400 meters, locating near formal settlements, unsuitable scenery of the city entrance (the most important reason according to the experts), beautification of the city and sustainable development, developing residential and

commercial lands, road construction, ugliness of the city and its emotional and social aspect, the depth of the problems in the neighborhood which were not be able to be resolved by organizing, reformation of the neighborhood structure and decentralization of the population in the area, existence of small habitat with old structures, lack of suitable access, social problems, delinquency and social disorder like gathering of addicts in the neighborhood, and high steep slope that causes landslide. Therefore, most of the neighborhood should be destructed and construction must be prevented in the area in order to prevent accidents and physical damages caused by natural disasters.

5.4.2 The Reasons for the Municipality's Failure to Transfer the People to the Proposed Places:

In the first years after destruction and clearance of the neighborhood, the municipality with the help of the government and other responsible organizations provided some places like Kiyammehr of Mehrshahr and Baghestan to transfer people. However, people did not accept this transfer. The reasons for the rejection according to the experts are as follow.

- The people's financial inability and lack of the governmental budget for constructing these lands and lack of necessary facilities and services,
- The residents' tendency to live in the city center and near to the main routes,
- Failure to inform the residents about the location and value added of these lands compared to their own habitats,
- Failure to improve the residents' culture and provide necessary infrastructure to transfer the people and as a result confusing them, and
- Issues involved in destruction and people's resistance against it and lack of seriousness by the municipality and allowing the people to whether leave or stay.

5.4.3 The Aim of Destructing: To Eliminate Informal Settlement or Improving the People's Lives:

This is one of the most fundamental aims in approaches of dealing with informal settlement. This aims should be paid serious attention by the executive managers of the projects. Perhaps focusing on one aspect of the issue has resulted in ignoring other aspects, which has finally led to the failure of all aspects. According to the experts, the ultimate aim of the project has been to destruct the hill, the houses, and the informal settlement in the area. In general, the experts believe that due to lack

of comprehensive investigation on the method of interfering with the situation in Islamabad, it has only been dealt with physically and without considering other aspects like socioeconomic and cultural ones, which has not led to any improvement in the displace people's lives. Therefore, the only result of the process was the destruction of the informal settlement and establishing a promenade without any planning.

5.4.4 Reconstruction and Revival Instead of Destruction and Clearance:

In this regard the experts' views include: the executives of the organizing project could have created a utopia by constructing some complexes with minimum expanses and preventing people from immigrating to another Islamabad by allowing them to live in the complexes. And if the rest of the hill was destructed, it could be used as a green space or residential recreational complexes to be used by the residents. In this regard, the experts have proposed that these lands can be utilized for Mehr housing and transfer the residents to the buildings, which is much better than the present situation in which they have been given some amounts of money that have resulted in establishing houses like their previous ones.

5.4.6 The On the Alternative Area

As a result of destructing and clearing the area, the lands of the hill have been freed and now there is a large unoccupied area that is ready to be utilized for other purposes. Here, timely utilization of these lands should be taken into consideration in order to prevent future problems and keep the security of the neighborhood. These lands with an area of 72 acres can also be used for other purposes so that the adjacent residents can benefit from them. Moreover, by appropriate planning, suitable projects can be conducted in this area and give the city a unique identity.

5.4.5 The Provided Facilities to the Residents in Order to Convince Them to Quit the Area:

According to the experts, successful conduction of the project depends on provision of facilities to the people who have lived within the area and satisfying them so that they can cooperate with the project executives. The project of destructing and clearing Islamabad neighborhood has been associated with destruction of houses and transfer of people to other places. Most of these people used to have illegal access to facilities like water and electricity.

Now, they have to be transferred to a new place but they cannot afford the transfer and the municipality and other organizations in charge have destructed the houses and forced the residents to quit. Here, providing the residents with facilities by the responsible organizations is required so that the project can succeed. People's dignity should be secured and if they are not transferred, their lands

should be valued by experts and they should be given the exact amount so that they can move by themselves. They can also be given loans or lands at reasonable prices. These have not been taken into consideration, which along with failure to guide people and provide them with services are among the main reasons for the failure of the project.

Table 2: The criteria are used in ANP model

A	A ₁	Neighborhood instability	C	C ₁	Improving people's lives
	A ₂	Unsuitable landscape		C ₂	Establishing promenade
	A ₃	Social and cultural disorder		C ₃	Eradicating informal settlement
	A ₄	Old structure	D	D ₁	Constructing residential complex
B	B ₁	Financial inability		D ₂	Constructing recreational complex
	B ₂	Failure to improve the culture	E	E ₁	Establishing security
	B ₃	Lack of people's knowledge about the land value		E ₂	Different utilizations
	B ₄	Tendency toward the city center	F	F ₁	Failure to guide the residents and provide them with services

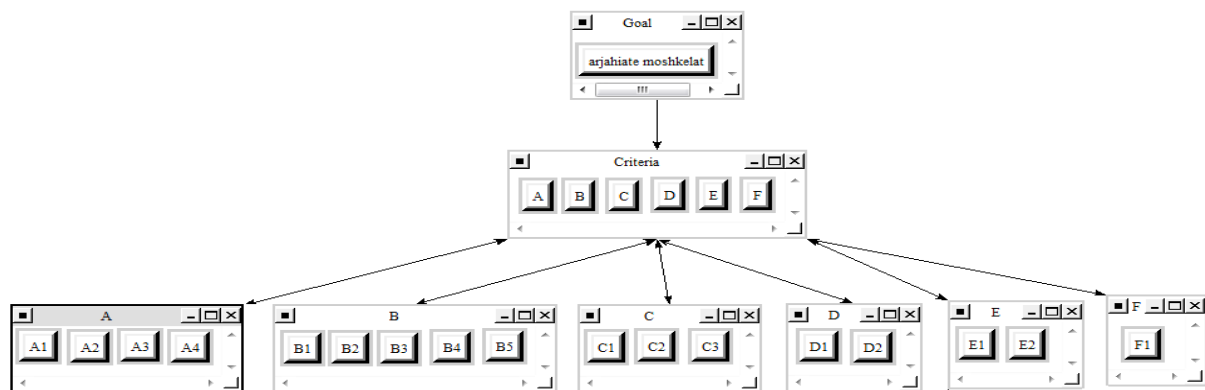


Figure 7: Structure of ANP model to choose best strategy for informal settlement neighborhoods in Super Decision

Here are the priorities.			
No Icon	A	0.19539	0.097697
No Icon	B	0.12870	0.064351
No Icon	C	0.04184	0.020919
No Icon	D	0.07028	0.035140
No Icon	E	0.02871	0.014356
No Icon	F	0.03507	0.017537

Figure 8: Classification of the factors according to the opportunities in ANP

In order to rate each of the factors affecting the destruction of the neighborhood, all of the factors

were again modified in a clearer framework and examined by our experts. Finally, the factors were evaluated using ANP model and it was concluded that factor A had the highest importance and priority compared to other factors. And among the sub-factors of A, factor A₁ had the highest importance.

6.0 Testing the Hypotheses

6.1 The First Hypothesis:

The project of destructing and clearing the informal settlement in Islamabad neighborhood has completely carried out.

This project was proposed in 1993 and carried out after two years and has lasted till now (2014). The project was predicted for an area of 72 acres in Figure 9. Classification of the factors following according to the opportunities in ANP. Moradab Hill. Although the project began years ago, it has not achieved its aim yet. Investigating the data on the area of the destructed buildings and periodic satellite images indicates that there are still some regions to be destructed. In order to figure out the process of the destruction during these years, periodic images taken over 2000-2014 were utilized.

Table 2 presents the rate of destruction from the first year of the project. Based on the investigations

Here are the priorities.			
Icon	Name	Normalized by Cluster	Limiting
No Icon	arjahiate moshkelat	0.00000	0.000000
No Icon	C1	0.25992	0.010875
No Icon	C2	0.32747	0.013701
No Icon	C3	0.41261	0.017263
No Icon	D1	0.50000	0.035140
No Icon	D2	0.50000	0.035140
No Icon	E1	0.50000	0.014356
No Icon	E2	0.50000	0.014356
No Icon	F1	1.00000	0.035073
No Icon	A1	0.12308	0.024049
No Icon	A2	0.62755	0.122621
No Icon	A3	0.18407	0.035966
No Icon	A4	0.06530	0.012759
No Icon	B1	0.35958	0.046279
No Icon	B2	0.29700	0.038225
No Icon	B3	0.18969	0.024413
No Icon	B4	0.09165	0.011796
No Icon	B5	0.06207	0.007989

that have carried out during 2002-2014 and also proceedings conducted before 2002 and during 1995-2001, it was concluded that an area of over 26 acres has been destructed which includes 1.3 of the 72 acres proposed area at the beginning of the project. Therefore, the first hypothesis was rejected.

6.2 The second hypothesis: The policy of destruction and clearance in the target neighborhood (Islamabad) has been successful.

Evaluating the success of the project includes all aspects like socioeconomic evaluation. Different projects can be evaluated through different methods and models. One of these models is the economic model of cost and benefit, profits and losses, and SWAT which can be used to evaluate different projects especially socioeconomic ones and figure out their positive and negative outcomes. In this section, the success or failure of the destruction and clearance project of Islamabad is evaluated based on the experts' views. In this regard, the experts had different views; however, most of them believed that the project has achieved little success and referred to lots of influencing factors. The experts also believe that the project has not succeeded and although a large fund has been spent on Kiyanmehr and Baharan Town to transfer the residents to, the project was misused and the residents practically gained no profit and they referred to other neighborhoods like Khate Chahar Hesar and 4th and 12th neighborhoods and informally resided there, which finally led to another crisis. Another reason is that no specific plan was figured out to transfer

people. In general, none of the plans has succeeded yet and there is no clear prospect of the final results. Moreover, the ANP model indicates that the most important factor in destructing these neighborhoods was the policy of destruction and clearance of Islamabad. In regard with the sub-factors, the experts believe that ugly and unsuitable landscape in the city entrance has been among the most important factors in carrying out the project. According to the above discussion it can be concluded that the project has not been a successful one in terms of the policy of destruction and clearance in the target neighborhood (Islamabad); therefore, the second hypothesis is rejected.

7.0 Conclusion:

As a result of recession in agriculture, the process of distributing the revenue of oil price increase, and uneven distribution of this revenue, villages receive a larger share of underdevelopment every day. In general, this trend has resulted in severe imbalance in settlement system. As a result, villagers swarmed toward cities hoping to achieve good jobs and higher income, have access to economic, industrial, and commercial facilities, and welfare services. In so doing they sold their lands for small amounts; however, they were unaware that with that small amount and having no skills they would not have a chance to live in cities. Therefore, they had to live in the suburbs and slums. Due to the poor condition of life in such places and also its bad effects on the residents and those who live around them, organizing and improving life quality in such places are critical. Different factors can be effective in organizing such places and preventing informal settlement. There have been different methods to prevent informal settlement, most of which have failed due to shortcomings in related political and economic issues. The project of organizing Moradab Hill and Islamabad neighborhood began in 1993 and has lasted for 20 years (2014). To destruct and clear Islamabad, the organizing office have bought the building units located at an altitude of over 1400 meters that had more unsuitable conditions especially in the 7th neighborhood and afterwards were destructed and cleared. Over 18 years of executing the project, 3947 in 5 neighborhoods of Islamabad have been destructed, which covers an area of 26 acres. In general, the 7th neighborhood that is located in the highest position with 1400 units has won the first place. During these years, 20722 residents have been displaced and the 7th

neighborhood due to the abovementioned characteristics has won the first place in this regard. The periodic high resolution satellite images indicate the destruction and clearance process, which shows that the process has not finished. Regarding the success rate of the project, the experts' views were utilized. They believe that although the project has succeeded in destructing the units, it has failed in transferring the residents to suitable habitats despite the fact that a large fund has been devoted to the project. Finally, it should be stated that the problem of slums cannot be resolved by force and more investigation is required; therefore, it should be considered in political and economic aspects. Since on the one hand a large number of poor people live in informal settlements of the city and live on informal sections and on the other hand most Asian cities are not free from informal settlements, the policies of poverty reduction should be directed toward the informal settlements and the informal occupations should be organized in slums and urban planners and designers should recognize such plans.

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