

## Rebirth of a city lessons learned from post disaster reconstruction; the case study: Rofayye'

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### Abstract

After disasters, one of the main challenges confronting authorities is site selection for reconstructing damaged structures. Experiences indicate that appropriate policies in site-selection could greatly influence on reconstruction success and residents' satisfaction. Meanwhile, in literature related to post disaster reconstruction, avoiding from relocating settlements is generally emphasized. However, when relocation is inevitable, adopting proper procedures is necessary to gain success. This article is about reconstruction of Rofayye' -a town in Khuzestan Province of Iran- after the Iran-Iraq war, which is a distinguished experiment from different aspects. Then all the town's components relocated from their situation, but in newly built city, still every part has an identifiable vestige of the former Rofayye', that's why some researchers considered it as "in-placement" by mistake. In this article, the narrative of annihilation and recreation of Rofayye' is described and important specifications which are considered when dealing with urban planning and design are explained. The main issues include preservation of formal fabric structure, neighboring pattern, tribal territories, former plot areas, and situation of distinguished urban elements. Moreover, providing urban standards and properly allocating responsibilities between authorities and residents were considerable. The article is based on an intensive research and practice done during Rofayye' reconstruction in 1980's. The research performed by qualitative method through extensive field study and analysis of maps, documents, and pictures. It is hoped that study of the instructive points of this experiment lead to improved future reconstruction programs.

Keywords: Reconstruction, Rofayye', Relocation, Displacement, Site-Selection

### 1. Introduction

The town of Rofayye' is situated in Khuzestan province of Iran. Its reconstruction after the war of Iraq with Iran is counted as a distinguished experience among Iran and the world's experiments in post disaster reconstruction. The reconstruction plan was accomplished in 1988 in such a complicated condition that six years after residents' evacuation, twice being severely destroyed and a final excavation and grading, there was no vestige of Rofayye'. However, with great efforts and overcoming many difficulties,

the reconstruction process ended in a plan that despite entirely relocating the old settlement and rebuilding a new one, after returning home, the residents could hardly believe the Rofayye's narrative of annihilation and recreation ...

As if, the reconstructed settlement was the same old village that passing of time it has obtained more organized and urban structure. What specifications had been contemplated in the new reconstruction plan that despite many changes and transitions, it still possessed the identity of the old Rofayye'? Furthermore, there is a principle question that whether reconstruction of Rofayye' was "in-placement and simulation of the past" or "displacement and implementing a new plan" indeed.

In this article, the site selection policies and design process in Rofayye' reconstruction is described and the principles and special characteristics which make it stand out, are explained. Moreover, the considerable process of data collection and making plan is presented. This experiment has many important points and instructive lessons in settlement reconstruction, especially on site selection and fabric design that could be

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applied to improve future reconstruction programs.

Reconstruction of damaged rural settlements during the war of Iraq with Iran (1980-1988) could be counted as the first organized presence of academic scholars in reconstruction experiments. The authors of this article also were engaged in various efforts undertaken by the research bureau in faculty of Architecture and urban planning of Shahid Beheshti University during reconstruction of war-damaged settlements. In 1982-1986, an extensive efforts and field surveys took place in all Khuzestan reconstructed settlements (more than 315 villages in Susa, Ahwaz, Khoramshahr, Abadan, and Dashte Azadegan) that their results and findings were published in numerous documents.

## 2. Research method

This article is based on the studies undertaken for the sake of a book about Rofayye' Reconstruction. Thus, in cooperation with those responsible in planning and designing Rofayye' from 1984 to 1989, their collection of sources including the plans, residents' identification and housing documents, pictures and sketches which were obtained during the field study were used. Besides, having free interviews with reconstruction authorities of Rofayye', their valuable information about the process of making and executing the plan was applied. Moreover, recent information was gained through interviews with authorities, talking to residents and taking pictures during field studies.

## 3. Introducing rofayye'

Before the war, Rofayye' was a town in Dashte Azadegan restrict of Khuzestan province in Iran that was developed into a city in 1997. It is located 27 kilometer to the west of Hoveyze and 3 kilometer to the east of marsh Hoor-Al-Hoveyze (Hoor is a shallow lagoon, marsh, or lake (maximum 8 meters in depth) that is formed from joining flowing waters in plateaus of region [3]) in plane plain near Neisan River. Fluctuation and changes in the water level of Karkhe and its branches often result in spate and decrease of Neisan water level in some months [1]. The marsh with its rich resources for producing foodstuffs and herbal materials such as hunting birds, fishing, keeping buffalos, and cultivating rice in its margins, have had important role in farmers' livelihood [2,3].

### 3.1. Social and economic characteristics

Generally, a continuing tribal social system with special divisions and specifications exists in Khuzestan and Dashte Azadegan. Each tribe and its divisions have a distinct territory, which consequently shapes up the pattern of settlements' establishment. The region around Rofayye' is the territory of the Savari tribe [4, 5].

After 1961, following policies of the ruling government, in order to develop new public services in frontier settlements, significant social and economic changes Took place in this region. Centralization of facilities in Rofayye' and repetitive flood occurrences in the region intensified the immigration rate to Rofayye' from neighboring villages [6].

The population of Rofayye' that was near 2000 person in 1966 [7] quadrupled through uniting with peoples of villages like Goban, Bores Goban, Lulie and Hasche. Consequently, it included 8555 person and 1475 families in 1981 [8] and was counted as one of the highly populated centers in this region.

The Rofayye's economy has been mostly based on agriculture and animal husbandry. Besides the main occupations, jobs such as fishing, mat making, shopping, hunting birds, and business were prevalent too. During 1961 to 1981, the resident's livelihood were improved due to different factors such as land reform, road construction between Rofayye' and Hoveyze and installation of water pump for bringing water from the river in the region. This matter reached its climax before the war [9].

### 3.2. Physical properties

In 1981, the fabric of Rofayye' town was 75.5 hectares area along both sides of the river (See Fig.1). The old southern part called "Rofayye' " and the new northern part named "Goban" were connected to one another through a bridge in the east. Southern part, like urban fabrics, had almost checkered network and the northern part, similar to rural fabrics in the region, was irregularly dispersed. An avenue along the road between Rofayye' and Hoveyze divided the southern part into two areas that most of the public buildings were situated on its sides. Access to the river was gained through narrow alleys which were perpendicular to the avenue.

At that time, there were 1037 housing units (822 units in Rofayye' and 215 units in Goban) and on average 1.45 Family lived in each unit. The average plot area in the entire town was 455 square meter (varied from 25 to more than 3200 square meter). The total substructure area was almost 81400 square meters and the average substructure area in each unit was about 80 square meters [13].

As far as the building materials were concerned, about 47% of the total substructure area were made of brick, 26% of mud, 24% of reed, and 3% were made of blocks. However, the amount of the materials used varied in two parts of Rofayye' and Gobban. For example the substructure area of mud and reed buildings in northern part was twice the southern part and the brick-made substructure area in Rofayye' was beyond ten

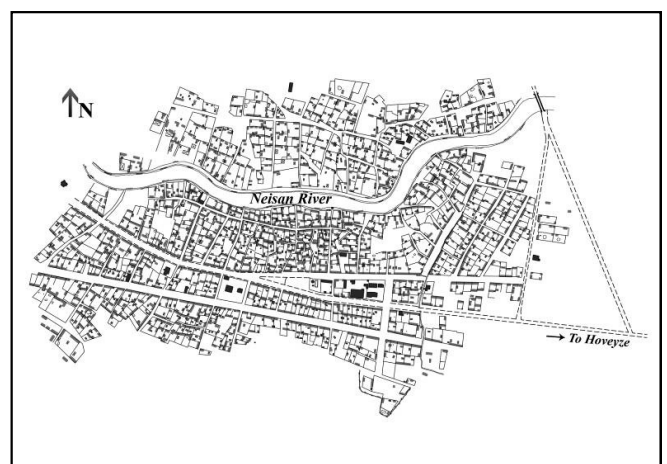


Fig. 1. The plan of Rofayye' in 1981(Authors)

times that of in Gobban The fabric of the town was highly developed from 1960's up to the war (1980). The river and tribal social system have been two basic factors playing an important role in these physical transformations:

“The river was the main axis which shaped the original fabric of Rofayye' and its surrounding lands. These lands were the most valuable lands due to having access to water, Hoor-Al-Hoveyze and neighboring regions. The construction of Rofayye'-Hoveyze road and the main street of the city around which concentrated public services, decreased the importance of the river and increased the value of the lands next to the street. Despite this, the river still plays a very important role as an access to the Hoor.

“The social system based on tribes [4, 5] has been the constant factor during all transitions. Studying all the houses and their residents' characteristics, it became evident that each tribe and its subdivision has its own territory. It organized the neighborhood pattern in the town that has been remained constant during all physical changes.

As the result of this, all the factors should be taken into consideration when planning any settlements or undertaking any physical programs specially site selection. Particularly, the tribal issues like their social and political history and borders should be considered in order to avoid social problems or conflicts among local communities.

#### 4. Rofayye' transformation during war

Rofayye' was one of the first towns occupied by Iraqi forces in September 1980. At the beginning, they destroyed the bridge between the two parts and then, demolished the southern part using heavy machineries (See Fig.2).



Fig. 2. The town of Rofayye' after demolishing by Iraq forces (Authors)

At the time, notwithstanding great destruction, all fabric elements such as streets, sidewalks, public structures, and the housing plots were recognizable. With the passage of the time, the natural factors, especially flood intensified the damages. In 1986, Iranian Forces executed two main projects, including Shahid Bakeri Road and barriers along the sides of Neisan River to military necessities.

The Shahid Bakeri Road was constructed beside the Hoor higher than the water level. Stretched from south to north, it reached Neisan River, then joined the road between Hoveyze and Rofayye' and through north of Rofayye' connected to Bostan-Fakkeh Road.

Moreover, the barriers were constructed with average of 4 meters in height along sides the Neisan River in order to limit Karkhe's floods and its extensive damages. The distance between barriers and the river was different due to the river's natural shape. In the town of Rofayye', it was about 20 meters from southern border and 500 meters from the northern border (See Fig.3). As a result, about 7 hectares of southern part of Rofayye' and the northern part was completely surrounded in the river bound.

These projects which were executed in some parts of Rofayye', made great changes in it. For this purpose, existing materials,

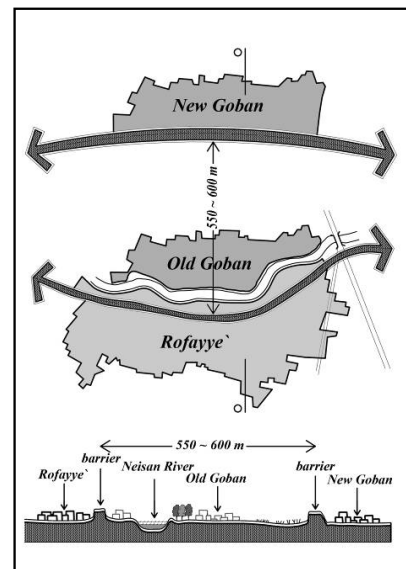


Fig. 3. The situation of Rofayye' and barrier (Authors)



Fig. 4. Using heavy machineries to remove debris and surface the town (Authors)



**Fig. 5.** The town of Rofayye' after surfacing by Iranian forces (Authors)

debris, and about 0.5 meter deep of the land's soil were removed (See Fig.4). Consequently, the town was destroyed and surfaced, so that no mark of Rofayye' remained (See Fig.5).

### 5. The process of data collection

The streets network and boundaries of housing plots were still recognizable from the existing debris in 1984. Therefore, a precise map of the town comparable to the pre-war condition was surveyed in scale of 1/1000. Then, areas of plots, location of the houses in plots, and their materials were determined through field studies and help of the local authorities.

It was then decided to reconstruct the town at its original position using this information. However, after a while, due to the immigration of the residents, more damage to the fabric of the town and completely flattening the town, problems were amplified, because it was not possible to determine the boundaries of land tenure and the owners. Thus, in 1988 using the map and going to the IDPs' (Internally Displaced Persons) temporary settlements, the information related to owners of the houses, the number of families in each unit, household size and the tribe they belonged to was registered. The procedure followed for determining the residents of each housing unit was very difficult.

In this manner, an almost precise statistics of the number of resident families in town was obtained. Accordingly, Rofayye' had 1475 families and population of about 8555 (The household size was assumed to be 5.8) based on the census results of 1976) in 1981 [8]. Assuming that the growth rate of population was 4.6% [14], it was estimated that population of Rofayye' would have amounted to 12260 people and 2110 families in 1989. The reconstruction plan was prepared to provide settlement and services for this population.

### 6. Introduction of Rofayye' Reconstruction Plan

Problems of several years of reconstruction of war damaged the rural settlements of Khuzestan had made instructive experiments available for reconstruction authorities which were applied in Rofayye's reconstruction Plan to prevent the same problems from recurring. Then, the most important challenge was how to reconstruct "Rofayye'" to remain "Rofayye'". To this end, the main principles and policies considered in Rofayye's reconstruction Plan consisted of the following cases:

#### 6.1. Relocation, An evitable option

Several years experience of reconstructing war damaged settlements in Khuzestan indicated that most of the reconstruction projects accompanied relocation were not successful for some reason, such as the city of Hoveyze and some villages in Dashte Azadegan region [15, 16]. Thus, the approach of "try to avoid relocating settlements in reconstruction" was become a direction.

However, due to the condition of Rofayye' that near one third of the town was surrounded between barriers; there was no solution except relocation (See Fig.6). Therefore inevitably it was attempted to consider the existing social system in reconstruction plan. In addition, reconstruction process was done in such a manner that would prevent from social and tribal problems.

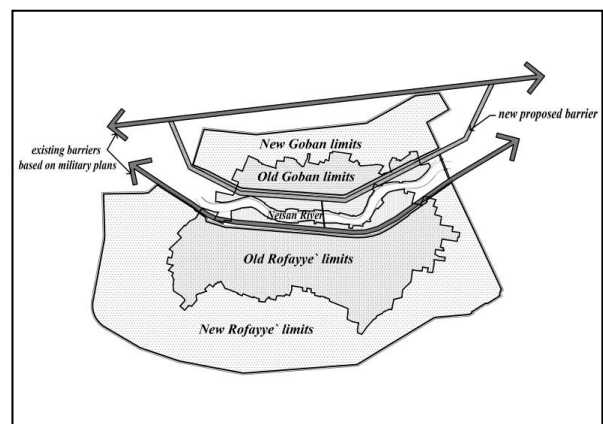
#### 6.2. Site selection for reconstructing new Rofayye'

In order to select a proper site, not at risk of flood, various options such as combining two parts of Rofayye' and Goban, shifting the entire settlement along the river and finding appropriate location to design new Rofayye', ... were considered. Finally, it was decided to construct a new nearer barrier to the river in northern part (See Fig.6).

This solution prevented aggression to farmlands that usually led to problems. Besides, a few elements reminding of the old town such as the bridge, meandering shape of the river, and the mosque (that before the destruction, it time was situated on the riverbank) were preserved to help people remind the image of the old Rofayye' (See Fig.7).

#### 6.3. Preserving the organization and structure of tribal territories

After selecting site, the most important issue in design process of the Reconstruction Plan was designing a city in such a manner that territories of the resident tribes remained the same as far as possible. Ignoring this factor in previous experiments had caused tribal quarrels. However, this could have not been achieved except by knowing the exact location of the pre-established territories and arranging them in the same pattern in the new settlement. (See Fig. 8, 9).



**Fig. 6.** Rofayye' relocation, the boundaries of old and new settlement (Authors)

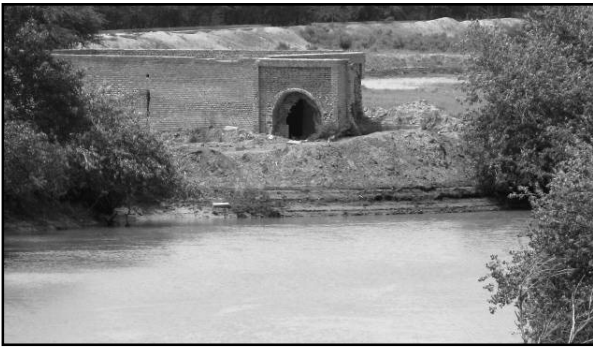


Fig. 7. Rofayye' mosque the only building remained after several changes (Authors)

#### 6.4. Preserving the proportion of plots' extents

One of the other serious difficulties in the last reconstruction experiments was neglecting the significance of the position and extent of the residents' former houses that had caused disagreements, dissatisfaction, and lack of people's collaboration in reconstruction process. Supposing that the land

did not have much value in villages, reconstruction authorities disregarded the variety of previous plots' extents. Thus they assigned equal extents for all families and divided the land based on the number of the residents per household new plans.

Therefore, in Rofayye's reconstruction, as mentioned, planners prepared a precise map of the affected Rofayye' and housing plots, then used the information of plots' extents and ownerships as the basis in designing the new plan. As a result, a city was designed in which there were not even two equal plots unless they had the same area in the past (See Fig. 10, 11).

#### 6.5. Retaining neighboring pattern

Traditionally, settlements in this region were in a way that different tribes lived within a definite boundary, in which family groups settled adjacent to one another. This is also prevalent in some other regions of the country and is rooted in family extensions along time and continual divisions of housing plots. Thus in designing process of new Rofayye', it was attempted to retain all neighboring patterns of the houses and their adjacency with natural and urban elements (See Fig. 12, 13). This approach resulted in provision of tranquility for residents and association of resembling of new and old housing situations.

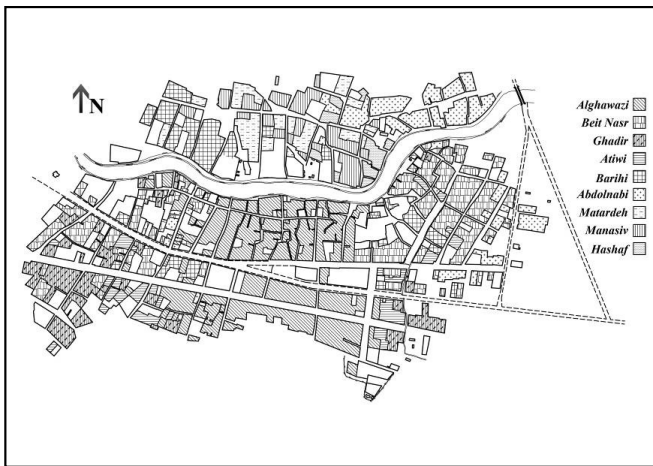


Fig. 8. The territories of various tribes in old Rofayye' (Authors)



Fig. 10. Various plot sizes in old Rofayye' (Authors)

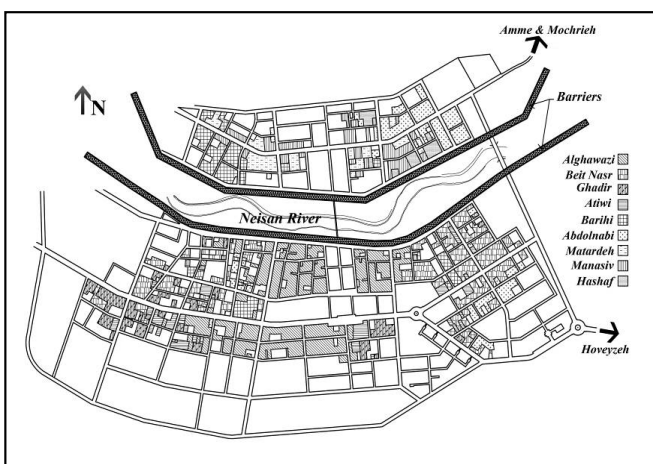


Fig. 9. The territories of various tribes in new Rofayye' (Authors)

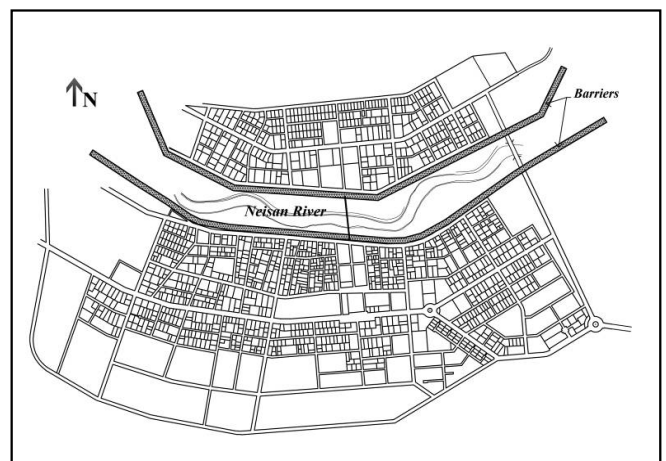


Fig. 11. Various plot sizes in new Rofayye' (Authors)

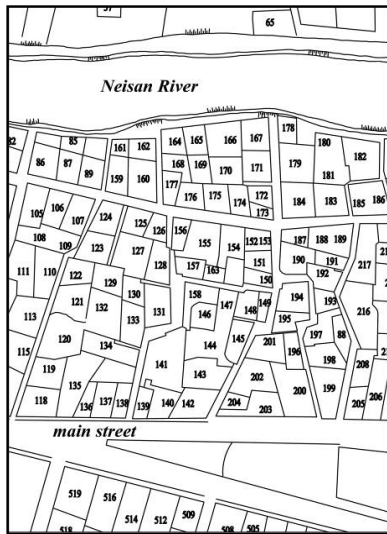


Fig. 12. The former neighboring pattern (Authors)

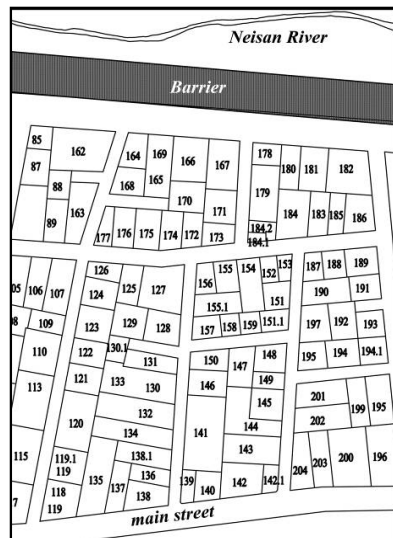


Fig. 13. The present neighboring pattern (Authors)

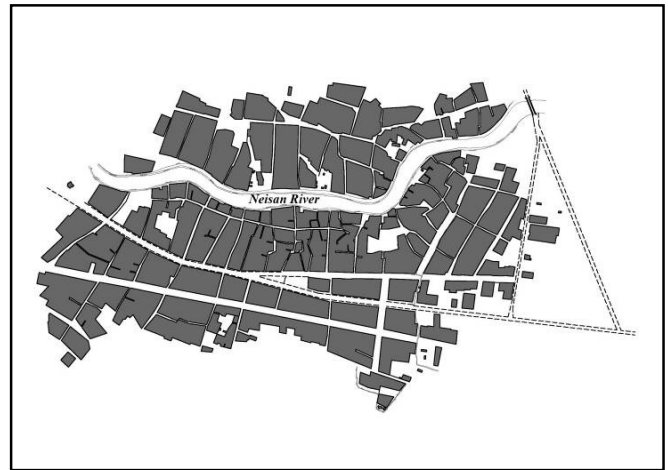


Fig. 14. The former formal structure (Authors)

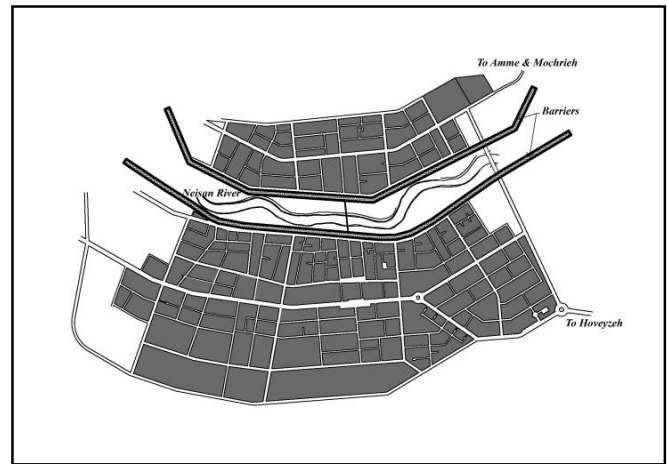


Fig. 15. The present formal structure (Authors)

elements like Bazaar, squares, schools and administrative buildings in a similar situation to the past as far as possible, in order to make a new city as similar to the city in memories of Rofayye's residents.

#### 6.6. Preserving visual organization

Formal structure of a settlement is such that impresses the mind and reminds people of the past. Considering this issue, the planners attempted to form the structure of the new city in a manner that reminds the onlookers of the old town of Rofayye'. Thus, the position and direction of the main streets was determined corresponding to the old town and the alleys which were perpendicular to the river and provided access to the water in the old Rofayye', were restored in the new plan (Fig. 14, 15).

#### 6.7. Preserving the situation of urban elements

In a settlement, the form and situation of urban elements such as administrative, commercial, educational and religious buildings remains in every observers' mind and results in legibility of the urban form and organization.

In new Rofayye' it was attempted to establish the urban

#### 6.8. Providing urban standards along with preserving former visual identity

The old Rofayye', like most settlements developed in past, lacked the standard condition in view of different public educational, recreational and sporting services, substructures, and landscapes, ... Thus, planners obliged themselves to meet these deficiencies in the new plan.

However, observing urban standards and codes in the new city, would give it a new dimension and proportion that largely differed from the past. Therefore, in order to apply the principles and maintain the old Rofayye' physical characteristics in the new plan, planners had encountered a great challenge. In designing the new city plan, they made great effort, both, to meet the urban standards and to restore the former form and structure. It resulted in a city that not only was similar to the damaged town, but also had an average level of urban standards.

### 6.9. Properly allocation responsibilities between authorities and residents

The reconstruction of Rofayye' could not be successful unless the tasks had been properly assigned to the authorities, planners, executives and residents. In other words, unlike many other experiments that residents were kept out of the reconstruction process, here, all phases were carried out by the cooperation of the authorities and the residents. For example, planners accomplished all data collection phases in collaboration with Rofayye' residents' representatives. In addition, design process was carried out by experts considering residents' viewpoint and consulting with their representatives.

Moreover, all responsibilities related to establishing substructures and public services such as sewerage, water and electricity system and streets entrusted to the reconstruction executives. Correspondingly, residents undertook managing, designing, and reconstructing their own houses, so the products were conformed to their needs, demands, and taste. Furthermore, the authorities were only responsible for providing building materials and supervising construction work so that it would be done right from the technical viewpoint.

On one hand, people's participation in areas which they could help, and on the other hand, authorities helping in areas which people lacked the technical and expert knowledge, resulted in acceleration of the reconstruction efforts and better adaptation of the settlement to the residents' needs and demands.

Last but not the least, although in housing construction there were difficulties in design and construction view, the outcomes such as people's satisfaction, absence of socio-tribal troubles and conflicts, made them become attached to the new settlement. This was due to their participation in various phases of planning, design and construction. All these factors turned the Rofayye's reconstruction into one of the most successful experiments of settlement relocation.

## 7. Conclusion

Considering Rofayye' transitions in 1980's and its reconstruction manner, one could hardly say that reconstruction of Rofayye' was replacement or in- placement, because contrary to other relocation experiments in which a settlement is relocated and reconstructed some kilometers away from its original position, the whole town of Rofayye' has almost been reconstructed in the same former geographical location. However, none of the plot and housing unit has been situated in its former place and in other words, none of housing units reconstructed in-place. Therefore, it could be concluded that Rofayye' reconstruction is a kind of relocation in which the whole settlement has been reconstructed based on a new plan over again. Applying mentioned principles in relocation and renovation of the whole settlement, made Rofayye' reconstruction one of the most successful reconstruction experiences.

Thus, the reconstruction process is not only doing a series of physical and structural measures, but the success of reconstruction efforts depends on applying comprehensive and integrated approach taken all physical, cultural, social and economic aspects of a society into consideration. Meanwhile, preserving the former settlement's identity can only be

achieved through observing the local patterns and respecting to the local society and residents' rights such as ownership and socio-cultural values.

The Rofayye' reconstruction experiment truly include valuable and useful lessons for planners and designers, when reconstructing or making any other physical intervention, they need to pay a great deal of attention to the settlement's characteristics, the existing facts and the apparent or obscure fact which possess a great deal of socio-cultural power that is deeply rooted in the society's mind and soul. Even though this experiment only took place in one part of the country, the results and the experience could be used when a reconstruction and/or relocation of a settlement is needed at any place and at any time.

**Acknowledgements:** We would like to thank all the colleagues collaborating during 1980's in Rofayye's reconstruction including the process of data collection, planning and design. We are also grateful to the authorities and people of Rofayye' who had an effective role in reconstructing the new Rofayye' and helped develop these studies. The authors wish to thank the reviewers for their careful reading and relevant comments

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