PRESERVING CITY COLOR PLAN, SURVEYING IRANIAN SUBMONTANE CITIES

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Abstract. No Considering color pallet of the buildings of every city, arouse a debate related to identity and aesthetics of urban environment. This debate is succeeded by researches about the color of cities, from limited hues of traditional city to numerous colors of modern city. The French Lenclos was the first one who after dedicating many years to the color subject, innovated a method of surveying color of cities; which is used by anyone who is researching in this field. This article after mentioning Lenclos' method of surveying color plan of cities, represents author's case study in color pallet of Lahijan. Author's method in this case study is a combination of digital photography and photo shop software along with Lenclos' method. Results (shown in a bar chart) confirm that although traditional color pallet of the city is still dominant, but it has some differences with citizens' opinion achieved by interviews and questionnaires.

Key words: color identity, local color, Lenclos' approach.

1. Introduction

Streets are an important part of public open space in the city. In urban areas, streets constitute a significant part of the public open space and are seen as the most important symbols of the public realm (Mehta, 2007).

Social commentators and scholars suggest that people's image of a city is often that of its streets. "For many urbanites it is the streets that represent the outdoors" (Jacobs, 1993). In the streets it is the façade that is responsible for the visual impact of a building, as the interface between the viewer and the built space that has a purpose, a signification and a context (Opincariu, 2011). Facades constitute of lines, surfaces, volumes and also colors. Colors include the Inherent color of materials and also colors which are added to facades to make them more beautiful or make a coherent view of the street. Protecting and restoring the color identity and the main character of the certain cities which are known for their specific character is expeditious. Juxtaposition of these colors, constitute the color map of a given city which is the main subject of this article.

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Here it should be mentioned that there is a difference between color mapping and color plan of a city. Color mapping is trying to record the existing colors of buildings that usually encompass the identity and the character of a city. But color plan is what urban planners and urban designers decide for the development parts of the cities in order to prevent chaos in today's rapidly growing cities. Gou and Wang believe that the "urban color plan is the game between urban planner and architect", but they also believe that "Color plan is necessary in the present stage of development due to rapid boom of urban construction and economy development" (Gou, Wang, 2007). In fact the present color plans can be taken as necessitous mostly because of its overall color effect, not as a controlling method for the government (Gou, 2009).

Let's return to color mapping of identified cities. The dominated colors constitute an important part of city identity. The distinction between main colors of different cities depends on various factors. These factors include color of local materials, mineral pigments in that region, culture of inhabitants, climate, etc. Recording colors of cities is a rather new issue on which researches has been started in 1960s leading to a suggestion of a methodology to record color maps of cities in 1970s. The color map of cities includes colors applied in walls, windows, doors and visible parts of roofs. Further, color of other parts such as dominated colors in natural environment including vegetation, color of water and the sky can be added to the map (Lenclos, 2005).

Documentation of color maps of cities is recording a part of cultural identity of cities. Original color map of each city along with construction technology and dominated forms of architecture, even

issues such as their costume and local food are considered as a cultural heritage of each city and area; obviously, it is vital to record and maintain them. Recording and maintaining color plan of each city as well as maintaining its mosques, public baths, castles and old houses, is maintaining the historical heritage as a treasure to pass to next generations.

On the other hand, technological developments and abundance of new construction materials which have a variety of colors eliminated those limitations that in past caused using few homogenous colors leading to creation of a unique pleasant collection of colors in entire city or each neighborhood. Development of a vast continuum of colors and materials and the ability to choose among them may be exciting at first sight, but later, it will yield disappointing results. Visual anarchy dominated in cities led demanding a comprehensive plan for colors as well as regulations to make it united.

Recording color map of cities can be used in providing a comprehensive plan for colors of cities. By the help of comprehensive plan of city colors, it is possible to predict diverse pallets for various neighborhoods. This plan will be beneficial especially for development areas of cities in which lack of identity is one of their inevitable problems.

The purpose of this study is to provide a common methodology of preparing color plans of cities. Then, the changes that the researcher has been made in the methodology will be stated using the case of Lahijan as an example. First, a brief explanation is offered about the first recorded color maps of cities in 19th century. Then the reason for dramatic changes in the method of using colors,

especially in 20th century and its results will be reviewed. In the following sections, different stages of Lenclos' framework in recording color maps of cities will be argued. Then, suggested changes by the researcher will be mentioned. Therefore, a combination between Lenclos' framework and digital photography to have samples of colors will be applied in the case of Lahijan.

2. Why this research is necessary

During last few decades, tendency to use color as a form-creating instrument was increasingly present and it has been an international phenomenon in cultural color. It is obvious that color design must consider improvement of the architectural quality of the space, aesthetic expression and pleasant psycho-climate, all according to the type of the social activity (Tomic, Maric, 2011).

For many years and even centuries, each city had its own material and mines to produce color used in facades. Pigments brought from other areas were costly and limited. Color pallet of each city consisted of local mining pigments, imported pigments and natural color of local material (Porter, 2009).

20th century witnessed a significant progress in this regard. At the first half of 20th century, industrial production of chemical colors started. Industrial production made possible production of related cheap colors. In 1980s, an interest to colors and a vast use of them in cities became extremely common (Swirnoff, 2005).

It should be admitted that the origin of color identity of cities was those limited range of local colors which developed radical differences between color identities of cities of different regions. Even cities located in the same region had

absolutely different colors due to their altitude and type of geology (Lenclos, 2005). Now extension of choice of color and its availability for all social classes, have removed those limitations. It is predictable that soon or late visual chaos in cities would be dominant that have no consequence but lack of identity.

Therefore study about color, color psychology and methods of using colors appears as a new field of research. Recognition of color pallet of cities and trying to protect it in inevitable reconstructions of CBDs and also in development areas is why this research necessitates.

3. Literature Review

3.1. Use of color since past till today

History of use of color in city and its buildings goes back to first civilizations. Mesopotamian cities were white cities. Adobe built houses of these cities had colorful insides, but from outside were painted white. On the contrary Greek cities were not white. Jack Ignase Hittorf found that Greek houses, temples and even sculptures were painted with bright colors, and today's whiteness of ancient Greek, is because of weathering of colors due to passage of time and effects of erosive factors such as wind and sun (Zybaczynski, 2013).

Vitrouvious in "*Ten books of architecture*" considered color in a closely related relationship to the finishing of facades, with the decoration, representing "*Venustas*" which is "*one of the appropriate principles that should govern the construction of all types of buildings*" (Zybaczynski, 2013).

The Renaissance and the Baroque brought the elimination use of color from the outside of the architecture and

focused on the inside. In eighteenth and nineteenth century color of locale building materials constituted of dominant colors of town relating to its identity. In the industrial cities of nineteenth century this color identity was covered with dust and smoke of factories. Fortunately number of industrial cities of those days was limited. Influence of modernism can be better seen in cities which this style was dominant.

The beginning of the twentieth century can be considered as a chromatic rupture, the color being removed from both the outside and the inside of buildings. The white replaces the "chromatic", remaining the color associated with the modern movement in architecture. The impression of modernism can be seen in cities that this style was dominant there. With the postmodernism, the color assumes new roles, through the exaggerated polychromies emphasizing both the volumes and the ornament, the colors varying from intense to medium range, rarely to pale range. The color becomes a significant part of an architectural composition and a space determining tool, focusing on both the physical qualities of color and its ability to draw attention, to highlight.

The last 40-50 years have brought forefront a holistic approach of color, namely "the harmonizing of architecture with the surrounding landscape and with the inhabitants" (Lancaster, 1996). Each building should not be seen in isolation, as an architectural object that exists in isolation (in city, village or natural environment) but, instead, must be seen in context, as a part of the environment to which it belongs. It influences the environment both through volume and the architectural language and chromatics, just as it directly influences it.

It was mentioned that industrial and almost cheap production of chemical colors leads to expanded use of color in cities. Awareness of the importance of color in architecture started a scientific approach to color subject between researchers, architects and colorists and a number of them such as Lenclos, Lancaster, Yoshida, and Brino began to study about the color of built environment (rural or urban) that succeeded an approach to architecture named "environmental architecture" (Caivano, 2006).

The issue of color in architecture has been approached in many ways and on many levels: the relationship between color and humans regarding the psycho-physiological influences (Meerwein *et al*, 2007), the relationship between the perceived color and the inherent one (Fridell Anter, 2008), the interaction between the architectural form and color (Caivano, 2006, Vosbeck, 2009), between architecture, color and city (Minah, 2008), the relationship between the color and the geographical location (Lenclos, 2004), and even the establishment of a methodology to create color harmony at the principled level (Zybaczynski, 2013), as well as the level of the architecture and the city (Kobayashi, 1998), each study focusing on certain aspects of the relationship between color and architecture. Giovani Brino between these researchers began a study about the relationship between color and the identity of city (Brino, 2009). He found that city of Turin in Italy has had a color plan to harmonize color of buildings in the more important streets and squares. This research beside Lenclos' researches about the relationship between the color of city and its geographical location was succeeded by contemporary color plan for different cities of the world, proposed by Brino, Tom Porter and Byron Mikellides.

3.2. The first recorded color plan of cities

The first plan of cities' colors in the world was created in nineteenth century by the council of constructors in Turin (Linton, 1999). This city was founded by Victor Amadeus II to show its glory and had a special color plan. It was based on the idea that the main streets and squares in a city has to be consistent with a homogenous color system with a unique architecture. The main Turin pallet of hues imitated the noble building materials: marble, granite, terracotta and brick (It should be noted that the cost of construction materials in each region depends upon the availability of constituents of construction materials or construction materials mines). Torin has had possibly limited access to suitable clay soils for making the tile and brick, which is not imaginable in Middle East). As Turin was an impoverished regional capital attempting to attract status using poor, stucco facades dressed with mineral pigments that acted as a simulacrum for a more expensive range of building materials (Brino, 2007).

When the French Lenclos started researching on cities' colors, he was not aware of this color plan. Because it was a century that an authoritarian bureaucrat proceeded to erode and obliterate the sophisticated polychrome city concept under a monotone layer of Molasses Yellow, the color whose pigment mines were close to Turin, carried out by train and was naturally cheap. Gradually the yellow color spread in all cities of region until it became known as "Turin yellow". Fortunately, due to exact recording of colored pallet in 19th century in documentation center of Turin city council, the plan was found in late 20th and revived by Giovanni Brino. It was difficult to revive and implement because the colors had been recorded only by

their names; there were no sample related to each name. By careful research in various texts, Brino managed to find equivalence for each color and execute that in Turin (Porter, 1997).

3.3. World experiences in recording color plans

The scientific method was founded by Jean-Phillip Lenclos. Many designers, color consultants and architectures used this method, including Byron Mikellides who proposed color plan of Savannah located in Georgia, United States (Mikellides, 2005), or Tom Porter who was in charge of providing a color plan for Oslo with a group of MA students at Oslo university (Porter, 1997). Recently, consultant engineers of Roger Evans are managing a project for New Hall which is a new development zone of Essex in England. By this project, consistent pallets will be provided for this developing area. It includes all the constituents of facades and even the color and material of floor (Linton, 1999). Unfortunately, even by a lot of searching, I could not find samples of stage by stage process of practically providing color plan, or even the final form of a color plan (It would be definitely very useful seeing a project that the international reputation of its contractor implies the reliability of plans).

Lenclos first wrote 'colors of France' about the differences of the colors of different regions of France in 1982. Then, using a codified method resulting from his studies, he published 'colors of Europe' in 1995. His research on color of cities world-wide leaded to his book 'world colors, geography of colors' in 1999 in French and 2004 in English.

However, trying to record color plan of Lahijan by adopting framework of Lenclos' researches, I have made some changes in details. It is the use of digital photography instead of sampling from building material, surfaces of facades, and the color of windows and doors. In following the method of using digital photography and evaluating photos by Photoshop will be explained. But before, how Lenclos got to this framework and its various stages will be described.

4. Methodology of Lenclos

Lenclos' purpose is to distinguish prominent features and details of architectural colors in a selected area, in general and in detail. Firstly, he chooses single or group houses as the representative of architectural and color qualities in their environment.

The selection depends on knowing the dominated colors in the case study city. After choosing buildings or a group of buildings which include colors introducing identity of the city, the colors will be analyzed in this way: His method consists of three stages: at first stage, his work depends on objective evidence. He takes samples of materials directly from the building and site. A small flaked layer (or forcibly flaked by tools!), a part of window color, a stone or some soil of the site, all of which consist color of that area collected as a series. This sampling of floors, walls, roofs, doors, shutters and all other details of the built environment are seen as general combination of colors. Lenclos usually sets samples on a dark board to display colors of the built environment (Fig. 1).When achieving a sample is not possible, its color is recorded by a manually painted card.

At second stage, the collected data are synthesized. The chromatic information thus obtained from a site, is then assembled in the studio for a long and meticulous process of synthesis. All the collected samples will be translated to painted gouache color cards which faithfully reproduce the original colors. This is a kind of interpreting colored materials to colored cards. However, this raises a problem: the physical samples obtained from materials are rarely in a single hue. A piece of a brick, stone or coating color which has been under erosion has many shades hardly to be expressed as single color. In these circumstances, either we should create a sense of color of the material by combining different colors or we should reproduce the dominant color of the sample as it is seen from a distance (or as we close our eyelid so a dim view we have).

When a collection of colored cards was completed, they are then classified into a series of panels which produce a color synthesis of both a site and its architectural elements.

The third stage is called systematic color conceptualizing. At this stage, the survey selection and synthesis of that in the workshop will be formed as a collection of applied colors appropriate to a particular site. It means that the sample colors of facades with the color of doors and windows (or shutters) will be classified in a pallet. Colored pallets can be provided in various forms. For instance, to show the relations among colors at one surface, one can use the method of making tables of equal surfaces of the existing colors in a pallet; they should be arranged systematically based on their lightness, concentration and tonality. Each of these tables can show color of walls; doors or windows.

Fig. 1. Samples of colors of the built environment (Photo: Lenclos, 2004)

Another version of our synthesis can focus more on the dimensional color relationships. It means that the colors picked from each facade are got together in small squares that are an abstract form of the facade of buildings. In this case, three colored charts are provided: (1) the general color of facades and roofs of a settlement, (2) The other chart includes predominant and proportional incidence of the colors of doors, windows and shutters; and (3) a chart that superimposes the elements of the selective palette on to the general palette. It provides a combination of all the colors of facades in equal adjacent squares. The third chart can be assumed to be the final synthesis of color samples of a supposed site which provides the historical and geographical notation of a site in a specific time and place. By applying mentioned pallets to the existing buildings or the proposed projects, both consistency and diversity can be achieved (Fig. 2) (Lenclos, 2004).

Lenclos' method in studying color plan of cities is regarded as a base for each research with the same topic. For the same reason, I took this method as a framework in research on cities of Iran; such as Lahijan. As it has been mentioned, Lenclos' method has been changed a little to be consistent with modern technology, explained below.

5. Author's Method to record colors of cities of Iran,   A Case study – Lahijan

5.1. Using digital photography and adding the factor of quantity

When the writer decided to use Lenclos' method (innovated in 1970) as her framework in survey research of colors in Iran, she faced with a serious problem. To cut samples from walls, gables or windows was not only very difficult but it was illegal. Therefore, an unknown researcher could not use famous Lenclos' approach to get samples. What the writer used was digital photography to record color of samples. Being easily used, digital photography has many advantages. Using Photoshop software, one can edit digital photos; even Photoshop tools can be used to help the research.
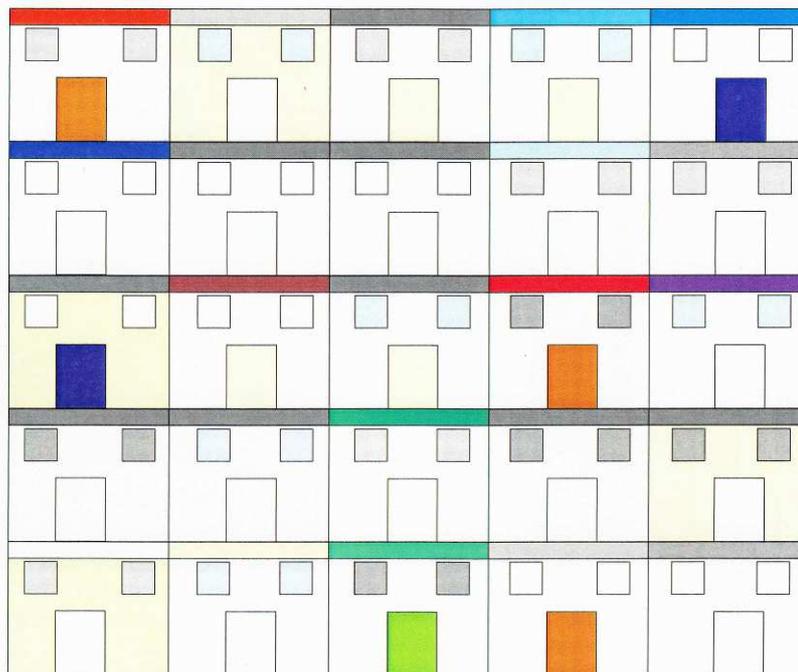
Fig. 2. Selected photo of Lahijan (Photo: Author)

The facilities in digital photography hit on the writer to add also the subject-matter of quantity of colors to the research. There was no clear perception in Lenclos' approach about the quantity. To distinguish quantity of each color, at first, the main colored areas must be identified for each photo. To explain main color, it has to be mentioned that each photo has many colors many of them are values of a single color. Mentioned values are resulted from trivial changes in light (such as being in light or shadow). For example, the single color of one wall in different parts of it is seen in three or four close but distinctive colors in its digital photo, because of changes in light and sensitivity of Photoshop software. Besides, green foliage has light and dark areas. Even the vegetation may show trivial differences regarding their color. To define a color as the main one, for the mentioned wall and the green of leaves of a specific plant, a single color is introduced as main color, despite having different tones. Further, the color of Lahijan facades are divided into three main groups: white, cream, gray-white.

To decrease the number of tones, the number of the colors of photo should be reduced to about 1/3 to 1/5 real colors. Thus, we need a computer program to identify close colors and take them as a single color. Such program can identify areas of main colors more easily and in shorter time. 'Quantifying colors is the process of providing a pallet of colors consisting of reduced number of colors of a photo… to find a quantified photo which is closed to the main photo (though it has less number of colors)' (Sudha *et al*, 2003).

After reducing the number of colors of the photo, area of each color should be calculated. It is possible to perform that by Photoshop CS5 which is installed in almost all the computers. In this approach, a network of perpendicular lines is superimposed on selected photo which is an appropriate case study of colors of intended urban environment. In this meshed photo, one may define the areas of main colors. Then, using the picker tool, the number of the squares belonged to each color group are designated and counted.

Trying to define color plan of Lahijan, after selecting the proper photo, the main color areas are reduced from 80 colors to 17. This is viable by decreasing the picture format to 75%. Then a mesh made of perpendicular intersected lines, making equal squares are superimposed on the selected photo. Then by using a selective tool named "picker tool" the squares belonged to each color (from the set constituted of 17 colors) are identified and counted.

Quantity of each color is shown in a bar chart. By using bar chart, not only percentage of each color is determined but also, comparison between their areas will be done easily by it. Finally, the resulting colorful features express the color plan of the environment of the selected photo.

The above approach was applied in surveying and recoding colors of cities in Iran. It has to be mentioned that selected cities are chosen according to their location in different geographical climates of Iran. Temperate and humid, dry and warm as well as cold and mountainous climates are considered in this research. In this article, the course of survey and record color plan of Lahijan is described.

5.2. The color plan of Lahijan

Lahijan is one of the cities of Guilan province with rich vegetation and plenty of rain. Rainfall makes an almost rapid erosion of superficies and changes their color.

To distinguish prominent color features and details of architecture, a group of buildings which are representative of architectural and color qualities in their environment are chosen.

To recognize dominated colors in the environment, some photos which are taken in different seasons should be taken as criterion. In these photos, the dominant color of facades is white. This is because of the material of their cladding which is a composite of white cement and rock powder. The white color of facades is not a pure white, rather mixed with hues of beige or gray which is the result of the composites of the cladding or the age of buildings. The materials of roofs are usually red terracotta or gray plates of gable roofs. Due to different ages of terracotta, their colors are in various tones of red. The color of the gable roof is usually gray which does not have prominent tones. Other materials used in covering roofs are slates painted according to owner's desire. Blue is the most favorite.

In choosing a sample photo to study color pallet of Lahijan, it has to be noted that Lahijan, Rasht and Anzali are three dense cities of Guilan Province. Smaller cities are less dense and their urban texture is open due to its temperate and humid climate. The degree of density in large cities and the degree of open spaces, vegetation and lakes or pools in urban context of small cities have been considered in choosing the mentioned photo.

In small cities, the soft view must absolutely be regarded in the photo. However, in Lahijan, there is no photo that covers merely built environment. That is because vege-tation has a strong presence. Such a photo would not be realistic. Anyway, it is obvious that separating of main structures from natural environment will result color pallet of the built environment. Besides, consi-dering soft view will show a combination of built and natural environment.

In the selected photo for this study, due to focus on about 25 buildings, the sky and perspective are omitted (Fig. 3). After selection of the sample, a perpendicular network with dimensions of 5 mm length of every square covered the photo. Then, as already mentioned, main color areas

are recognized. For this purpose, equivalent tones of a single color or colors that are very close to each other are regarded as a single color. After reducing about 80 colors to 17, the number of squares for various tones of green, from dark to pale covers 37% of bar chart. A small amount of red and brown is also seen in city pallet. Therefore, as it can be seen in bar chart (Fig. 4), the prominent colors in Lahijan buildings are white, beige and pale gray, and gray for shingle roofs. The next prominent color is green. This is the color of doors, window frames and also the city vegetation. Vegetation does not refer to soft landscape of Sheytan kooh (mountain bound on city), as the latter was omitted from the photo deliberately. But the green of trees and plants are seen everywhere in city and protrudes itself as a prominent color. More than color of doors and window frames, red and brown are the color of terracotta or other roof materials.

These results show despite of development of Lahijan in recent years, colors of traditional pallet are still dominant. This may be due to use of traditional material is still common in Lahijan and the percentage of using new materials is not as much to make a chaos in color identity of the city.

From this findings, some criteria can be derived which can prevent disharmonic colors usage that result in visual chaos in future. These criteria can easily transform to a color plan proposed to authorities of Lahijan. Such a color plan not only can preserve color pallet of city, but also propose diversity in different districts of the city especially in development areas.

6. Conclusion

Although the only color plan before the 20th century has been recorded for Turin,

it has to be known that the color of each city both in that era and at the present is considered as its identity. The difference between colors of cities was due to the limitations their residents had regarding the local materials and pigments. The result was a significant difference between the color of cities in various areas and a consistency within each city.

Nowadays, the appearance of chemical colors and their variety has made significant changes in color of cities after a number of limitations due to conventional inorganic colors. These changes with no specific framework are going to dominate identity color of cities and change it to a chaos. Visual confusion is the result of easy and cheap accessibility to a vast number of colors that necessitates a consistent plan for each city. Production and implementation of these color plans not only utilized in revival of depressed inner cores but also helps to characterize their style. Therefore, one can not only use systematically a variety of colors but also protect color identity of cities.

Lenclos was the first one who paid attention to the color of cities. In his innovative method he analyzed existing colors of an urban environment by gathering samples of its colors.

Adjusting Lenclos' method with modern technology, we can elevate its efficiency. Instead of cutting parts of facades, flaking color from doors and windows, or gathering different kinds of soil and local stones and manually painting color cards with gouache to make pallet, with the help of digital photography, the colors can be recorded. Digital photography makes determination of frequency for each color possible and providing color pallet of cities or their development areas will be easier and more comprehensive.
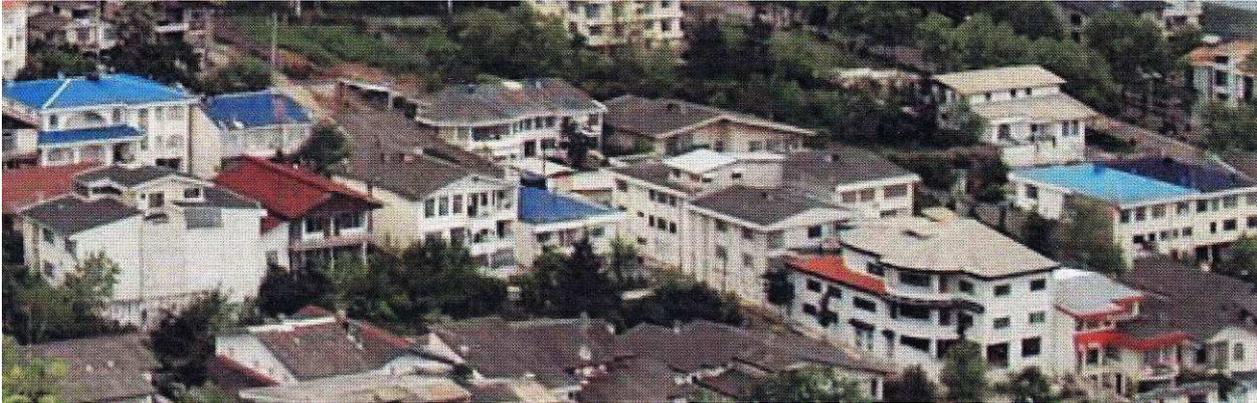
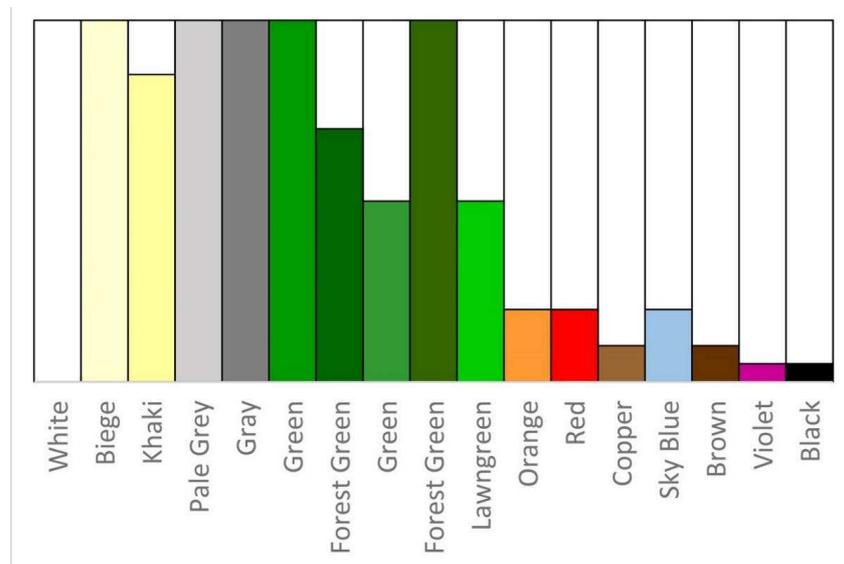**Fig. 3**. Selected photo of Lahijan (Photo: Author)

Fig. 4. Bar chart of colors of the environment (By: Author)

In this research, as a case study, the color identity of Lahijan was studied. The result of case study shows that most used colors in Lahijan are white, beige and pale gray for facades, gray for gable roofs, green for doors, window frames and vegetation among buildings, red and brown for terracotta of old building roofs or for colored materials of new roofs.

This research should be done for other cities of Iran with distinct various climates and different from that of Lahijan. Then, finding the common points and differences, the influential factors in colors of cities will be discovered.

Knowing influential factors in combination of specific colors of each city

not only helps determination of real identity of each city but also enables the researcher to predict future developments of cities due to changes in the past, suggesting an appropriate pallet in its color plan. Determining factors is especially significant and efficient in providing color plan in development areas or new cities, because in theses urban environments there is no past to be regarded as criterion. Determining the mentioned factors needs another research.

However, it must be considered that in combination of influential factors on color of cities, all the mentioned factors do not have a similar importance. In each city, the factors are combined with a specific proportion creating pallet of that city. In

comparison of colors of different cities and degree of influence of the factors, this matter should be reckoned and examined in case.

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