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EVALUATION OF THE EFFECTS OF RENOVATION OF WORN-OUT TISSUE IN COLD CLIMATE ON ENERGY CONSUMPTION IN THE RESIDENTIAL SECTOR, CASE STUDY: AGHAJANI BEIG NEIGHBORHOOD OF HAMADAN

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Abstract

Today, organizing parts of cities that have worn out over time, as well as reducing energy consumption in cities, is an important issue for urban planners. This can have a significant impact on reducing the consumption costs and the environmental impact of fossil fuel consumption. Accordingly, the general purpose of this study is to find the effect of worn tissue renovation on energy consumption in cold climates and for this purpose, Aghajani Beg neighborhood of Hamadan was studied. The results of this study suggest that regeneration of worn-out tissue in cold climates with increased tissue density can be effective in reducing energy consumption. Because gas consumption for heating in this climate is more than energy consumption and correlation analysis results show that gas consumption has inverse relationship with number of floors and building age. On the other hand, it was observed that by changing the physical structure and consequently changing the social composition of households living in renovated buildings, the mean age and average income level increased and studies have shown that these conditions have a significant effect on increasing energy consumption, but from the factors that reduce and increase energy consumption in this study it was found that energy consumption in the apartment sector is about 88.19%, average consumption in worn out and About 87.14% show moderate consumption of non-worn and non-apartment parts.

Keywords: worn-out texture, energy consumption, increased density, economic and social impacts.

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1-INTRODUCTION

One of the major issues in today urban planning is organizing parts of Cities that have worn out over time. Large cities have high air pollution, which is often caused by the consumption of fossil fuels. It is noteworthy that more than 98% of the energy consumption of buildings in Iran is provided by oil and gas products (Nasrollahi, 2011, p2). Reducing energy consumption in the construction and housing sectors will have a significant impact on total energy consumption, and this is economically and environmentally necessary. Organizing approaches to worn-out textures, including improvement, renovation, and reconstruction, can be effective in shaping the city's form. Today, choosing the physical form of the city in accordance with the pattern of energy consumption has become one of the most important issues in urban planning. (Qala-e-Novi & Sheikh, 2016, p. 2) Probably by 2030 Global energy demand to increase by 40 to 50% (UN-Habitat World, 2016) In the United Arab Emirates, Abu Dhabi, more than 80 percent of total energy demand is seen in buildings (mirkovic & alavadi, 2017, p. 278) In Iran, large amounts of energy are consumed annually in the residential sector. According to the Fuel Efficiency Optimization Organization of Iran, the share of fuel consumption in buildings is about 38% of the total fuel consumption in the country (Arabzadeh & Kazemzadeh Hanani, 2005, p. 2) The amount of energy used in the residential sector is related to the climate, building characteristics, number and characteristics of energy consumption devices, and the social and economic level of the residents (Sosa, 2018, p. 138). Urban complexes must be sensitive to the state of the natural and climatic environment and the artificial environment that saves energy and resources .this saving needs to be considered from the planning stage to urban design in each of the urban elements (Qala-e-Novi & Sheikh, 2016, p. 2) According to the urban policies of many cities that want to do endogenous development and attention to the worn texture along with increasing density, and also considering the location of Hamedan city in cold and mountainous climate and being in Complex of cities with high energy consumption (Maskan, 2010, p. 79) and also the existence of 698 hectares of worn-out tissue (news.mrud, 2015) The purpose of this paper is to investigate the approach of increasing density in the worn-out tissue of the city in energy consumption and also to examine the impact of the economic and social situation of the residents of this tissue in energy consumption.

2- THEORETICAL FOUNDATIONS

The Urban texture can be seen as a physical accumulation of space-building units. Here, the Review of form, at different scales, both in two and three dimensions, can be a combination of these physical components in the case of individual buildings, blocks, urban areas, and the entire urban texture. It is also possible to pay attention to the space between them by examining the pattern of streets and squares. (Madanipour, 2005 p. 48) Dilapidated urban fabric refers to areas within the legal boundaries of cities that are vulnerable due to physical deterioration, lack of proper access to vehicles, facilities and services and urban infrastructure and have low value of spatial, environmental and economic; (Maleki, 1395, p. 2) Old and historically valuable structures, which are usually more than 80 years old, and urban structures that are worn either physically or in terms of activity, and significant parts of cities are more than 30 years old, are among the worn-out texture. In order to sustain urban development, improvement and renovation plans and measures should be done to regenerate and revitalize worn-out tissues. Urban regeneration is an attempt to stop the decline in various dimensions such as social, economic, physical, environmental and remove the tissue

from the cycle of degradation (Topchi, 2010, p. 3) Organizing worn tissue can be effective in shaping the city and energy consumption. There are two main approaches to compact city and Sprawl city in shaping cities Historically, the compact city has been a response to the sporadic trend in developed countries, and its main purpose is to improve the quality of life, not at the expense of future generations. This idea seeks to create cities with high density, but far from the problems of the modernist city (Saif al-Dini et al., 2012, p. 161). Increased density in compact cities is proposed with three different views, increasing density in the whole urban area, increasing density in specific units and divisions within the city, and increasing density in one core instead of multiple cores (Richadson & Gordon 1997) But despite all the support and theoretical and empirical studies, especially in western cities, discussions about the advantages and disadvantages of compact cities are still ongoing. There are two environmental benefits to a compact city, one is to prevent the loss of quality land and the other is energy efficiency. One of the ways to achieve sustainable development is to reduce energy consumption and greenhouse gas emissions, which in the last two decades has received more attention from researchers and politicians, is the reform of the city form (Hajipour & Forouzan, 2014, p. 18). Apart from the status of the texture, the economic and social status of the residents is one of the variables that is effective in energy consumption in the residential sector. Therefore, the study of the inhabitants of the worn-out tissue in the renovated and non-renovated sections in terms of social and economic structure can clarify the impact of these variables along with other cases.

3-NECESSITY OF RESEARCH:

It seems that the effect of renovation of worn-out tissue along with increasing density and transformation of worn-out tissue in cold regions on energy consumption has been studied less. Also, according to the proposal proposed in the research, Functional in the residential sector, case study: Shiraz city "(Hajipour & Forouzan, 2014) In order to investigate the effect of economic and social characteristics of households on energy consumption, this study seeks to find a result of comparing the economic and social status of residents and the density of existing dilapidated buildings with reconstructed parts. This article also seeks to clarify the ambiguity of this subject matter. Has the climate of Hamedan, such as the hot and dry climate of Kashan and other cities of this climate, as stated in the study "Investigation of effective factors in energy consumption in worn-out areas of Kashan" (Heydari, Sourshajani, 2015) show the amount of energy consumption in worn-out tissue in comparison with the renewed tissues?

Therefore, this research seeks to answer the following questions:

- What is the effect of renewing worn-out tissue along with increasing tissue density on energy consumption in buildings?

- how is the energy consumption of dilapidated buildings in comparison with the reconstructed buildings in cold and mountainous climates?

- What does the economic and social characteristics of households living in dilapidated areas have to do with energy consumption?

4- REVIEW OF RESEARCH LITERATURE:

Passive handling of the density growth process unknowingly can lead to energy dissipation in this tissue. Various studies have been conducted on energy consumption in the city and worn-out tissue, including Belén, Correa, Cantón in the article "Neighbourhood plans for Energy Efficiency in Low Density Housing: A Case Study of a Dry City in Argentina "(Belén, Norma Correa, & Alicia Cantón, 2018) Using ENV Imet software to test and simulate different modes Buildings and streets made it clear that energy savings in hot, dry cities, especially for social housing, depend on design and street design, planning decisions, urban density, proper orientation, urban trees, and building materials. . mirkovic, alavadi in the article "The effect of urban density on energy consumption and solar energy: a case study of Abu Dhabi" (mirkovic & alavadi, 2017), they describe how urban density affects solar radiation and increases heat and leads to a decrease. Requesting cooling of the building for low-lying neighborhoods of the UAE. Rescha and André Bohne in their article "The Impact of Urban Density and Building Height on Energy Consumption in Cities" (Rescha, André Bohne, & Kvamsdal, 2016) show that depending on the population and longevity of the building, the optimal building height is in the range of 27-7. They also state that the issue of climate significantly affects energy results. Hajipour and Forouzan stated in the article "Investigating the effect of city form on the amount of functional energy consumption in the residential sector in a case study: Shiraz city (Hajipour & Forouzan, 2014)" Consumption levels of functional energy have a strong correlation. Also, there is a correlation between the quality of building construction, building life, type of structure and area with the amount of functional energy consumption. Sheikh and Qala-e-Novi in the article "The effect of city form on energy consumption optimization case example: Mashhad city" (Qala-e-Novi & Sheikh, 2016) by examining the shape of Mashhad city and its role in energy consumption using correlation analysis and ECOTECT software for Climate information analysis has provided solutions to achieve the optimal pattern of energy consumption with the influence of urban form. Safaei and Taleghani in the article "Optimizing Energy Consumption in Buildings" (Safaei & Taleghani, 2005) Referring to the pattern of energy consumption in the domestic sector and its role in environmental pollution, the optimization of fuel consumption was explained both in terms of the quality of energy supplies and in terms of how to build the building. Naghizadeh in his article "Criteria of Urban Development and Architecture of Fuel Consumption Optimization" (Naghizadeh, 2002) Recommendations and references to the criteria for selecting building materials, building form and recommendations on dimensions and sizes and height of buildings in the city for consumption have optimal energy. Heidari and Sourshajani in their article "Investigating the factors affecting waste and energy management in dilapidated residential areas of Kashan" (Heidari Sourshajani, 2015) have presented solutions to prevent waste and optimize energy consumption and state the results of the study The amount of energy consumption and loss in the worn-out tissue of Kashan city shows that contrary to popular belief, the amount of energy dissipation in this tissue is almost equal to other tissues.

5- RESEARCH METHODS:

The research methodology in this study is analytical-descriptive research in terms of purpose and from the perspective of applied-developmental research that is done in Aghajani Beyg neighbourhood in Hamedan. In the present study, a combination of descriptive-analytical methods, field study and correlation research have been used as a method of collecting information in the form of documents / libraries and referring to the relevant organizations as well as field interpretations. In the first stage, after referring to the existing documents and documents related to the worn-out tissue, the city form and compiling the theoretical foundations section and research background, describe and analyze the effect of worn-out tissue density on energy consumption in the residential sector. The use of the criteria extracted from the first stage of the research was investigated by Aghajani Beyg Hamedan neighbourhood as a case study and as a field survey by referring to the mentioned area, information was collected about the existing buildings in the context and the economic and social situation of the households. taking steps to complete the database Extracting the information used by the target households by referring to the Hamadan Gas Company's gas company database and Hamadan Electricity Distribution Company, information related to 353 residential units located in 157 license plates that are in the desired texture was collected and the annual electricity consumption and electricity consumption. Gas was extracted from each household and then, using Spss and Excel software, research variables were extracted, including the classification of the types of buildings in the tissue and the average energy consumption of each household and determining the correlation between energy consumption and economic and social status. Income level, level of education and age of households living in The texture and quality of the buildings are calculated in the specified types, and finally, by analyzing the data, the results are presented and the guidelines are presented in order to select the approach of renovating the worn-out texture, which will be accompanied by reducing energy consumption in buildings The dependent variable in this study is the amount of energy consumption (electricity and gas) and the possible variables of increasing density in worn-out tissue as well as the economic and social status of households in the types of buildings in the studied tissue and the variable climate control. In this study, variance analysis and correlation are used to find the relationships between variables. To achieve this, consider the correlational relationship if both variables are distance / relative (energy consumption and age) from Pearson correlation coefficient, as well as in cases where one variable has a relative scale and the other has a nominal or rank scale. The coefficient of correlation between the data used has and energy consumption, building life and energy consumption, economic status, energy consumption, building been used (energy consumption, education quality, age and building life) in order to study and correlate the relationship between variables. On a nominal scale with a nominal or rank (income and life of the building, education and the life of the building) and Phi Cramer's correlation coefficient was used. Using the interpretations of Table 1 in the analysis of the correlation coefficients, the data obtained in Table 1 are evaluated.

Table no. 1*:* Correlation coefficients

Interpretation	The correlation coefficient
Weak	0-0.29
average	0.30.0.69
strong	0.70-1
it can be ignored	-

Source: Mirzaei, 1394

6-INTRODUCING THE STUDY AREA:

Hamedan province is located in the west of Iran and Hamedan city is the center of this province. This city is located at the hillside of Alvand mountain and at an altitude of 1741 meters above sea level and is one of the coldest cities in Iran and a large part of the city is in a dilapidated area. District 2 is the municipality of Hamadan. Due to its location in the central area of Hamedan, this neighbourhood is one of the old neighbourhoods with a very worn texture. On the other hand, a number of existing buildings have been built after demolishing dilapidated buildings with new rules and often in several floors and more densely than before.

Figure 1: Location map of the study area in Hamadan

Source: Author, 1399

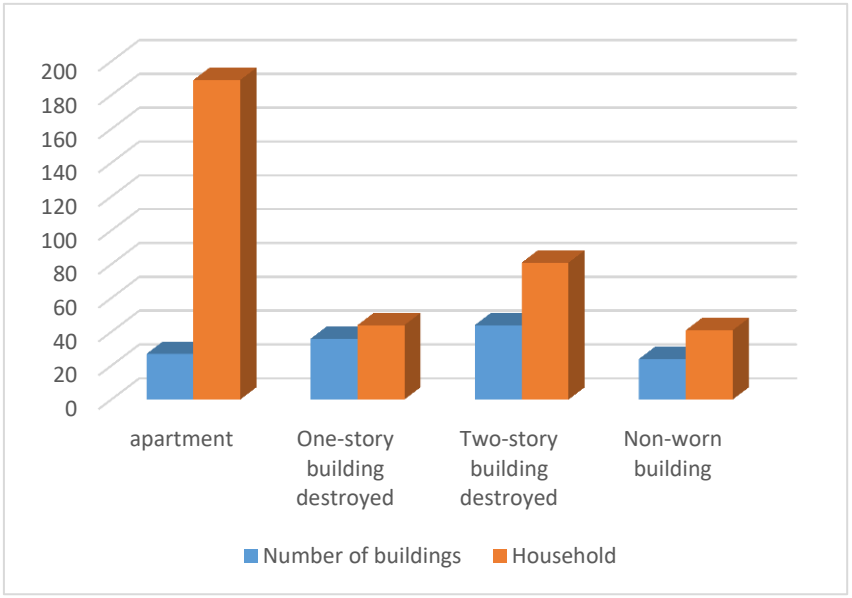
Figure 2: Aghajani Beg neighbourhood center is being renovated

Source: Author, 1399

Figure 3: Abundance of residential buildings in the study area

Source: Author, 1399

Figure 4: The quality of the buildings in the study area



Source: Author, 1399

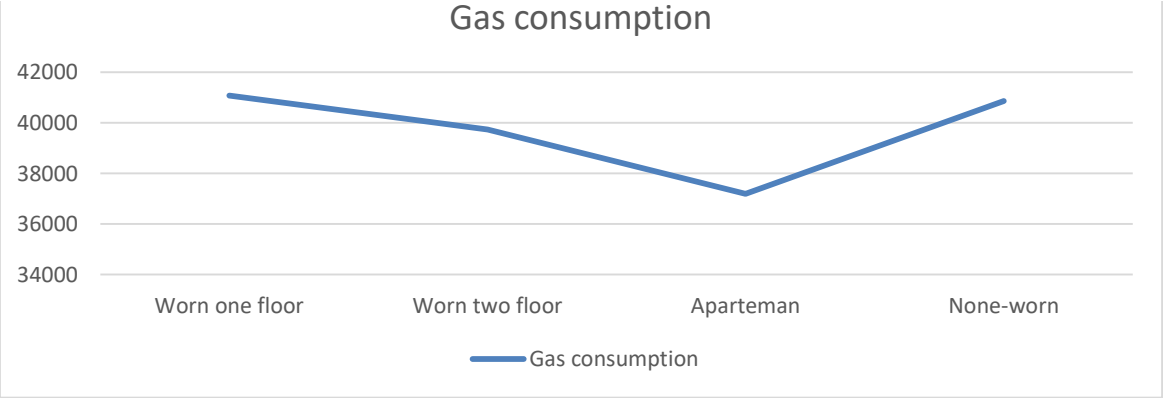
Due to the unequal data units per capita of electricity and gas consumption, we have to convert the units into a common unit, so in the data of gas consumption, which is obtained in cubic meters, considering the thermal value of natural gas, which is 8600 kcal per meter The cube is gas, and due to the fact that each kilowatt hour of electricity consumption includes 851 kilocalories of energy, the data were measured by converting the unit into kilocalories and the per capita consumption was considered per square meter.

Table 2: Per capita annual energy consumption in different types of buildings calculated in terms of kilocalories per square meter

Non-worn	Apartment	A dilapidated Two-story building	A dilapidated one-story building	Building type / energy consumption
40867200	37191200	39732000	41073600	**gas**
148680688	149713193	149885277	144550669	**Electricity**
4235400688	3868833193	4123085277	4251910669	**Total**

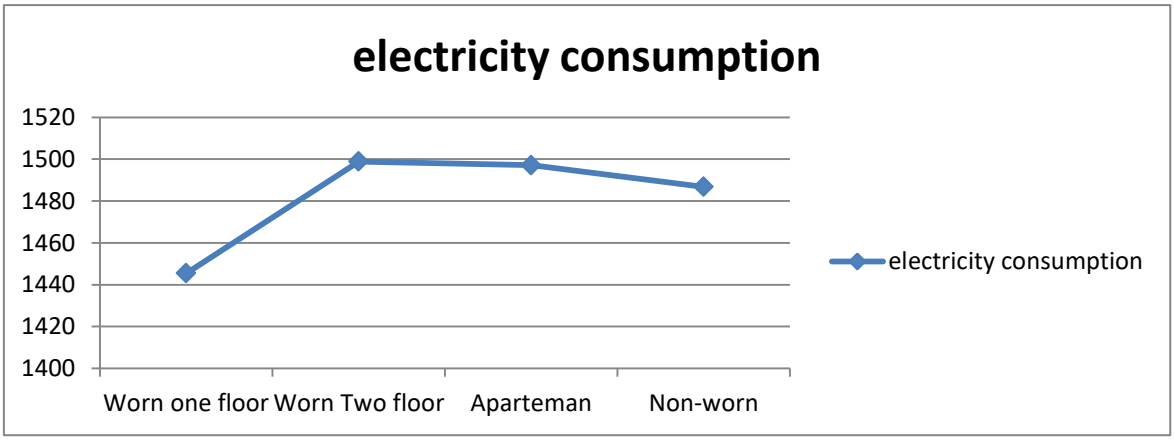
Source: Author, 1399

Figure 3: Average per capita annual electricity consumption in the residential area of the study area in terms of 1000 kcal



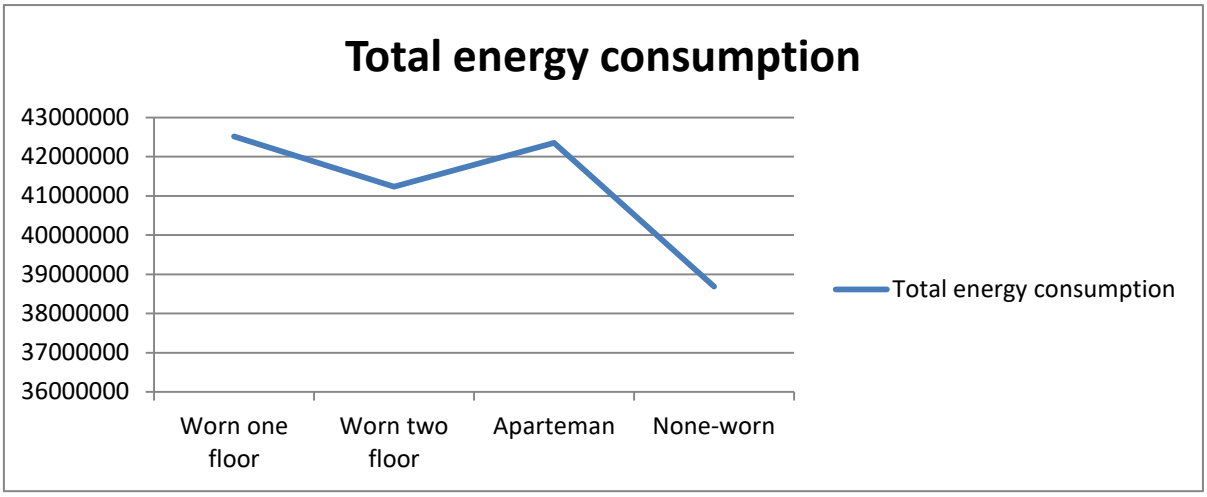
Source: Author, 1399

Figure 4: Average per capita annual gas consumption in the residential area of the study area in terms of 1000 kcal



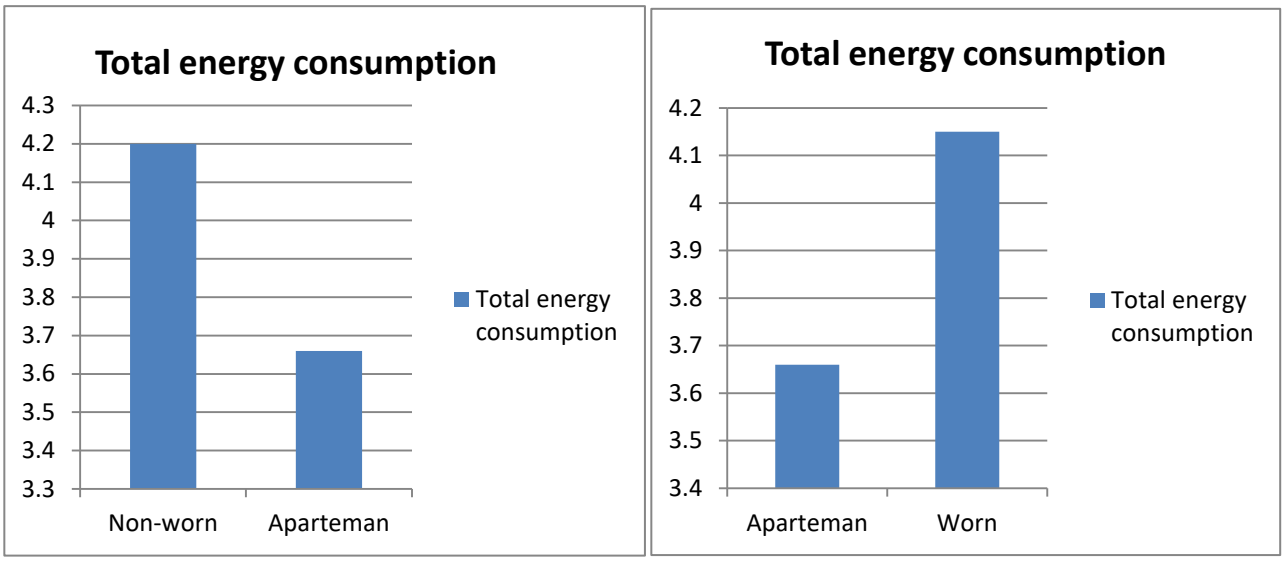
Source: Author, 1399

Figure 5: Average per capita annual energy consumption in the residential context of the study area in terms of 1000 kcal



Source: Author, 1399

Figure 6: Comparison of energy consumption of apartment sector with worn and non-worn sector



Source: Author, 1399

Table 3: Interpretation of variable correlation coefficients (density, income level, education level, age)

Interpretation				The correlation coefficient	Variable 2	Variable 1
high	medium	low	Negligible		energy consumption	
	•			0.511	Gas consumption	**Building quality**
	•			0.423	electricity consumption	**Building quality**
	•			0.491	energy consumption	**Building quality**
•				0.753	Gas consumption	**Building age**
	•			0.511	electricity consumption	**Building age**
	•			0.766	energy consumption	**Building age**
•				0.883-	Gas consumption	**Number of floors**
		•		0.276	electricity consumption	**Number of floors**
	•			0.663-	energy consumption	**Number of floors**
	•			0.407	Gas consumption	**Income level**
•				0.815	electricity consumption	**Income level**
•				0.741	energy consumption	**Income level**
		•		0.147	Gas consumption	**Education**
		•		0.171	electricity consumption	**Education**
		•		.0162	energy consumption	**Education**
	•			0.085-	Gas consumption	**Age**
	•			0.512-	electricity consumption	**Age**
	•			0.498-	energy consumption	**Age**
		•		0.277-	Building age	**Age**
	•			0.385-	Building age	**Education**
	•			0.305-	Building age	**Income level**

Also, by examining Table 3, it can be interpreted that building age and gas consumption, building age and energy consumption, number of floors with gas consumption and number of floors and income level with energy consumption and income level with electricity consumption and age of head of household and energy consumption There is a strong correlation, but it should be noted that only with correlation, it cannot be concluded that changes in one variable lead to a change in another. Therefore, when it is stated that two variables are correlated with each other, it means that the relative position in one variable is correlated with the relative position of the other variable and between the pair of variables and the level of income and gas consumption, building quality and gas consumption, building quality and Electricity consumption, building quality and energy consumption, building age and gas consumption, building age and electricity consumption, building age and energy consumption, building age, education and building age, income and building age, there is an average correlation.

Also, according to the above diagrams, it is observed that energy consumption in apartments created in the tissue is lower than other groups, while in electricity consumption in apartments is higher than other groups, but due to being in Cold Climate Gas energy consumption has a significant impact on total energy consumption, so that energy consumption in the apartment sector is about 88.19% of the average consumption in the worn sector. Also, the reconstructed non-apartment texture shows more energy consumption compared to the apartment texture, so that in this section, the comparison of energy consumption shows a difference of about 87.14%

8-CONCLUSION:

In this study, it was found that the renovation of worn-out tissue in cold climates along with increasing tissue density can be effective in reducing energy consumption, because studies have shown that gas consumption for heating accounts for a larger share of energy consumption in this climate. And secondly, gas consumption shows an inverse relationship with the number of floors, so energy consumption in apartments replaced with dilapidated buildings compared to existing dilapidated buildings and non-dilapidated buildings with low floors is significantly reduced. But on the other hand, with the renovation and physical change of texture, we see a different social composition in the texture, so that the population living in renovated buildings have a lower average age and higher average income. Studies have shown that the average younger age consumed more electricity and Higher income includes higher electricity and gas consumption, so this study saw a multifaceted analysis of variables, and finally, considering all the studied aspects, it seems that despite the reducing effect of social and economic conditions of future residents of the renovated tissue in Energy saving, increasing density in worn tissue in cold climate due to reducing the level of contact with uncontrolled outdoor air and construction by observing the new principles of energy saving leads to a reduction in gas consumption, which ultimately consumes Will reduce energy in worn tissue in the home sector.

9-SUGGESTIONS:

The studies conducted in this research examined the home sector and the body of buildings, in other words, part of the internal factors, and the results regardless of external factors such as infrastructure costs and environmental pollution due to increased traffic volume of motor vehicles and also Increasing the pollution of fossil fuel consumption at a constant level of tissue was considered more with the increase in the number of residential units and households , therefore it is suggested: in the next research, the mentioned cases should be weighed, in order to comprehensively evaluate the cost and benefit of the methods of organizing the worn tissue by calculating the effect of external factors and internal factors.

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